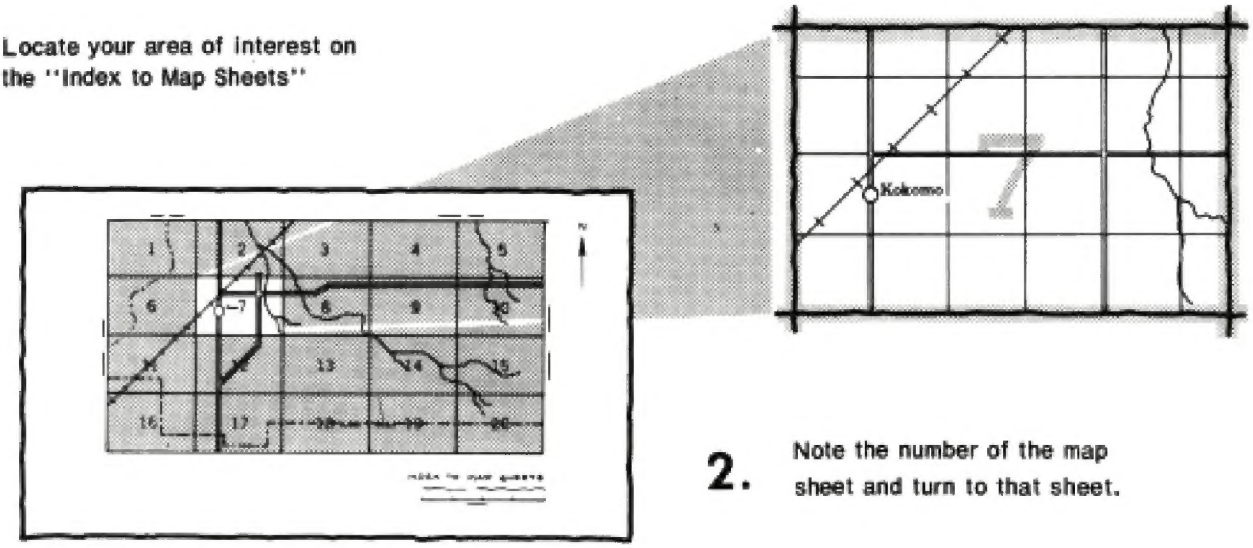
Soil Survey Of
Conejos County Area, Colorado

United States Department of Agriculture
Soil Conservation Service
in cooperation with
the Colorado Agricultural Experiment Station

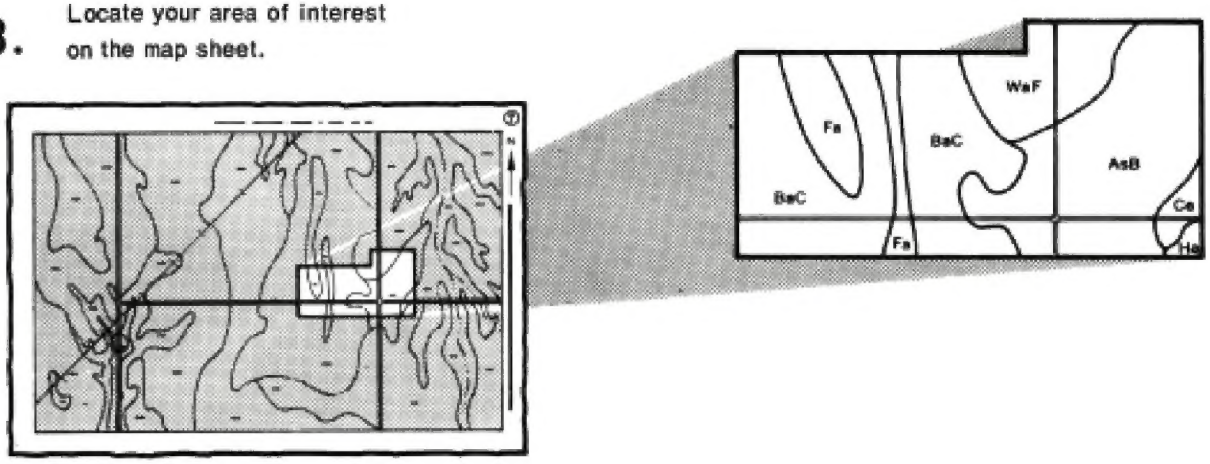
HOW TO USE

1. Locate your area of interest on the "Index to Map Sheets"

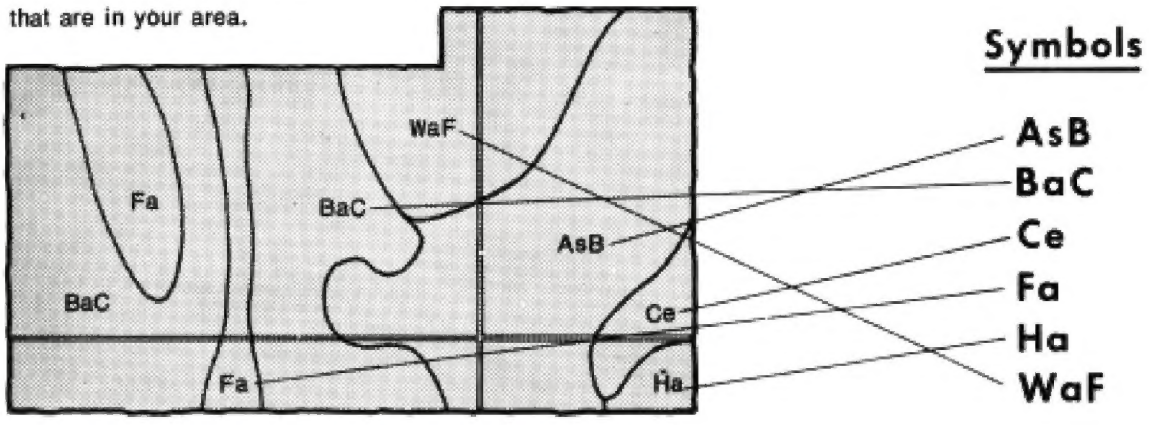


2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.

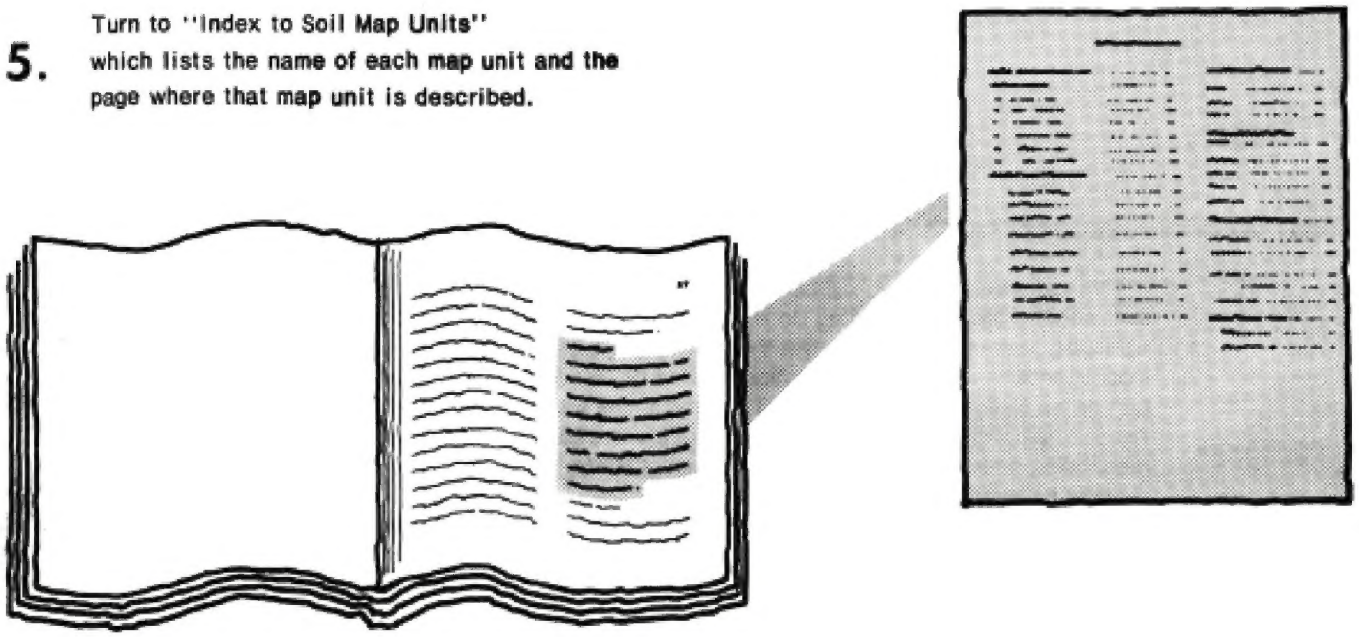


4. List the map unit symbols that are in your area.

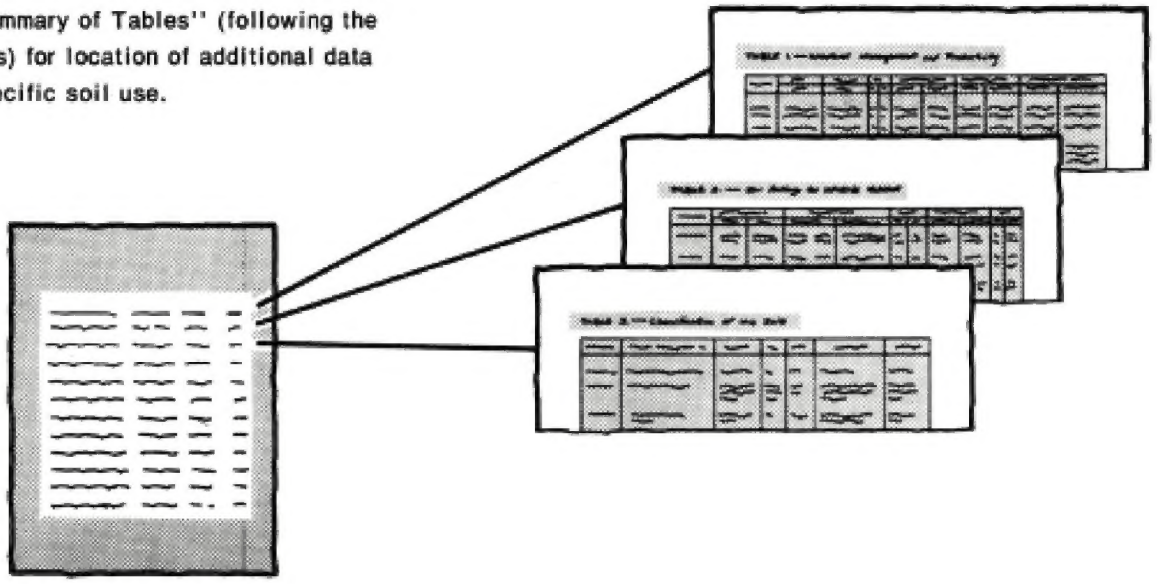


THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

This is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and agencies of the States, usually the Agricultural Experiment Stations. In some surveys, other Federal and local agencies also contribute. The Soil Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in the period 1969-1974. Soil names and descriptions were approved in 1976. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1974. This survey was made cooperatively by the Soil Conservation Service and the Colorado Agricultural Experiment Station. It is part of the technical assistance furnished to the Conejos Soil Conservation District.

Soil maps in this survey may be copied without permission, but any enlargement of these maps could cause misunderstanding of the detail of mapping and result in erroneous interpretations. Enlarged maps do not show small areas of contrasting soils that could have been shown at a larger mapping scale.

Cover: Summer range for cattle and habitat for deer and elk on Bushvalley-Youga complex, 3 to 25 percent slopes.

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Issued September 1980

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Summary of Tables

Foreword

This soil survey contains much information useful in land-planning programs in the Conejos County Area. Of prime importance are the predictions of soil behavior for selected land uses. Also highlighted are limitations or hazards that are inherent in the soil, improvements needed to overcome these limitations, and the impact that selected land uses will have on the environment.

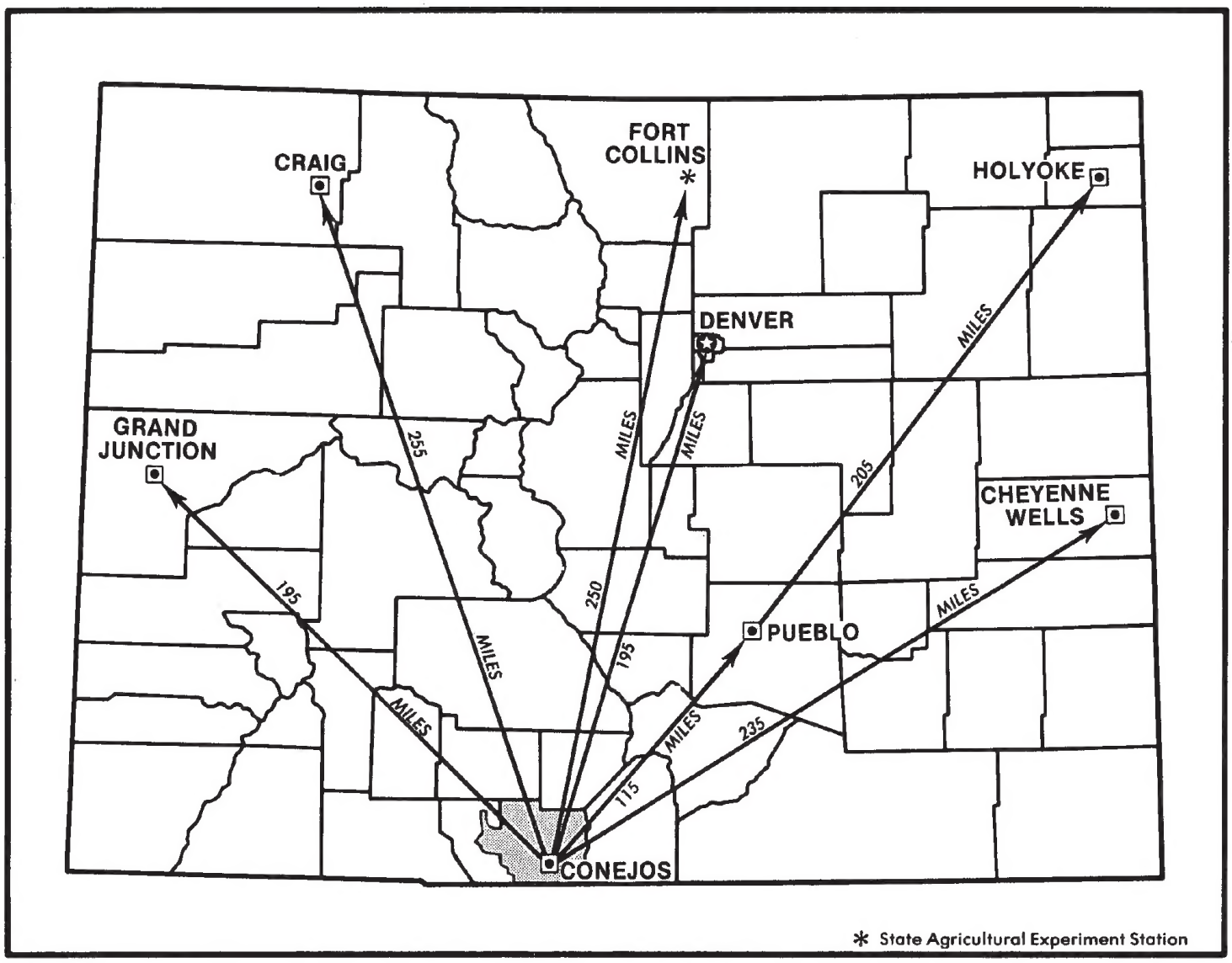
This soil survey has been prepared for many different users. Farmers, ranchers, foresters, and agronomists can use it to determine the potential of the soil and the management practices required for food and fiber production. Planners, community officials, engineers, developers, builders, and homebuyers can use it to plan land use, select sites for construction, develop soil resources, or identify any special practices that may be needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the soil survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur even within short distances. Soils may be seasonally wet or subject to flooding. They may be shallow to bedrock. They may be too unstable to be used as a foundation for buildings or roads. Very clayey or wet soils are poorly suited to septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map; the location of each kind of soil is shown on detailed soil maps. Each kind of soil in the survey area is described, and information is given about each soil for specific uses. Additional information or assistance in using this publication can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

This soil survey can be useful in the conservation, development, and productive use of soil, water, and other resources.

Robert G. Halstead
State Conservationist
Soil Conservation Service



Location of Conejos County Area in Colorado.

SOIL SURVEY OF CONEJOS COUNTY AREA, COLORADO

By James M. Yenter, Gerald J. Schmitt, William W. Johnson, Jr. and Richard E. Mayhugh, Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service in cooperation with the Colorado Agricultural Experiment Station

The Conejos County Area is in a broad, high mountain valley in south-central Colorado (see facing page). It has an area of 487,358 acres, or 762 square miles. Roughly half of the area is on the nearly level floor of the valley, where the average elevation is about 7,700 feet. The western half of the area ranges from gently rolling to steep foothills and mountains that rise in elevation from about 7,800 feet to about 10,500 feet. Conejos County Area is bordered on the west by National Forest land, on the east by the Rio Grande River (fig.1), on the north by Rio Grande and Alamosa Counties, and on the south by New Mexico.

General nature of the area

The history, natural resources, climate, and farming of the area are briefly described in this section.

History

The Conejos Area is in the San Luis Valley, which was Spanish Territory for many years. In 1848, the land included in modern Conejos, Costilla, and Alamosa Counties was ceded to the United States by Mexico. In 1854, a group of Spanish Americans established the first settlement in Conejos County near the present town of Conejos. This settlement, which was frequently attacked by Indians, was later moved to Guadaloupe. In 1878, a group of Mormons came to Los Cerritos, where they farmed and built a school. In 1879, the east half of Manassa was surveyed and settled by other Mormons. Antonito was started in 1880 when the Denver and Rio Grande Railroad was extended to the south and west.

The population of Conejos County reached its peak in the early 1900's and has steadily declined since. In 1970 the county had a population of 7,663 and no city of more than 2,500 persons (*3*). Agriculture is the main source of income, but tourism, mining, and timber production account for part of the economy.

Natural resources

Soil and water are the most important natural resources of the area. Sheep and cattle that graze the rangelands, crops that grow on irrigated farms, and timber that is harvested from the forests are marketable products produced on the soil.

Irrigation water for the Area is obtained from the Rio Grande and Conejos Rivers, the Alamosa and LaJara Creeks, and irrigation wells. These wells vary in depth and amount of water available (*4*). A few of the irrigation wells, as well as many stock water and domestic wells, are flowing artesian wells. Because of the dry climate, farming is not possible without irrigation water.

A few small mines are operated in Conejos County. There is a turquoise mine near Manassa. Some gold, silver, and other ores are mined in the western part of the county near Platoro. Sand and gravel deposits, which are under many of the soils on the valley floor, provide material for local roadbuilding.

Farming

Ranching and irrigated farming are the principal income-producing activities. Early settlers were primarily sheep ranchers. In recent years sheep ranching on the extensive rangelands has declined, and most ranchers primarily raise cattle. Livestock are grazed on mountain rangelands in the western part of the county during the summer. Winter feed for cattle and sheep is raised on many of the irrigated farms.

The number of farms and ranches has been declining over the past 30 years, and the average farm size has been increasing. There are about 395 farms operating in the county. Most of these are from 160 to 640 acres; the average size is 1,100 acres.

The main crops and the approximate acreage on which they are grown yearly are: meadow hay, 28,000 acres; alfalfa, 23,000 acres; barley (fig. 2), 18,000 acres;

oats, 5,000 acres; and potatoes, 5,000 acres. Lettuce is grown on about 500 to 1,000 acres in most years.

Climate

Summers are warm or hot in most valleys and much cooler in the mountains. Winters are cold in the mountains. Valleys are colder than the lower slopes of adjacent mountains because of cold air drainage. Precipitation occurs in the mountains throughout the year, and a deep snowpack accumulates during winter. Snowmelt usually supplies much more water than can be used for agriculture in the county. In valleys, precipitation in summer falls as showers; some thunderstorms occur. In winter the ground is covered with snow much of the time. Chinook winds, which blow downslope and are warm and dry, often melt and evaporate the snow.

Table 1 gives data on temperature and precipitation for the survey area, as recorded at Manassa for the period 1952 to 1974. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 21.6 degrees F, and the average daily minimum temperature is 4 degrees. The lowest temperature on record, which occurred on January 12, 1963, is -34 degrees. In summer the average temperature is 61.4 degrees, and the average daily maximum temperature is 79.6 degrees. The highest recorded temperature, which occurred on July 13, 1971, is 94 degrees.

Growing degree days, shown in table 1, are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

Of the total annual precipitation, 5.52 inches, or 71 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 3.95 inches. The heaviest 1-day rainfall during the period of record was 1.45 inches on August 5, 1954. There are about 44 thunderstorms each year, 30 of which occur in summer.

Average seasonal snowfall is 28 inches. The greatest snow depth at any one time during the period of record was 11 inches. On the average, 4 days have at least 1 inch of snow on the ground, but the number of such days varies greatly from year to year.

The average relative humidity in midafternoon in spring is less than 35 percent; during the rest of the year it is about 45 percent. Humidity is higher at night, and the average at dawn is about 77 percent. The percentage of possible sunshine is 77 in summer and 73 in winter. The prevailing wind is from the south-southeast. Average windspeed is highest, 10.4 miles per hour, in April.

Climatic data in this section were specially prepared for the Soil Conservation Service by the National Climatic Center, Asheville, North Carolina.

How this survey was made

Soil scientists made this survey to learn what kinds of soil are in the survey area, where they are, and how they can be used. The soil scientists went into the area knowing they likely would locate many soils they already knew something about and perhaps identify some they had never seen before. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; the kinds of rock; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material, which has been changed very little by leaching or by the action of plant roots.

The soil scientists recorded the characteristics of the profiles they studied, and they compared those profiles with others in counties nearby and in places more distant. Thus, through correlation, they classified and named the soils according to nationwide, uniform procedures (*14*).

After a guide for classifying and naming the soils was worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, roads, and other details that help in drawing boundaries accurately. The soil map at the back of this publication was prepared from aerial photographs.

The areas shown on a soil map are called soil map units. Some map units are made up of one kind of soil, others are made up of two or more kinds of soil, and a few have little or no soil material at all. Map units are discussed in the sections "General soil map for broad land use planning" and "Soil maps for detailed planning."

While a soil survey is in progress, samples of soils are taken as needed for laboratory measurements and for engineering tests. The soils are field tested, and interpretations of their behavior are modified as necessary during the course of the survey. New interpretations are added to meet local needs, mainly through field observations of different kinds of soil in different uses under different levels of management. Also, data are assembled from other sources, such as test results, records, field experience, and information available from State and local specialists. For example, data on crop yields under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and

other data have been assembled. The mass of detailed information is then organized and published so that it is readily available to different groups of users, among them farmers, managers of rangeland and woodland, engineers, planners, developers and builders, homebuyers, and those seeking recreation.

General soil map for broad land use planning

The general soil map at the back of this publication shows, in color, map units that have a distinct pattern of soils and of relief and drainage. Each map unit is a unique natural landscape. Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in other units but in a different pattern.

The general soil map provides a broad perspective of the soils and landscapes in the survey area. It provides a basis for comparing the potential of large areas for general kinds of land use. Areas that are, for the most part, suited to certain kinds of farming or to other land uses can be identified on the map. Likewise, areas of soils having properties that are distinctly unfavorable for certain land uses can be located.

Because of its small scale, the map does not show the kind of soil at a specific site. Thus, it is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The kinds of soil in any one map unit differ from place to place in slope, depth, stoniness, drainage, or other characteristics that affect their management.

Soils dominantly on flood plains, fans, and terraces

These are nearly level to moderately steep, somewhat excessively drained to poorly drained, deep to shallow soils. They occur throughout the Conejos County Area except in the extreme western part.

There are eight map units in this group of soils. They make up about 84 percent of the area.

1. LaJara-Mogote-LaSauses

Nearly level, deep, poorly drained and somewhat poorly drained soils on flood plains and low terraces

This map unit is mainly in the northeastern part of the survey area. It consists of soils developed in alluvium from mixed rock at elevations of 7,600 to 7,900 feet. Vegetation is dominantly meadow grasses and shrubs. The average annual precipitation is about 7 or 8 inches, mean annual air temperature is about 41 or 42 degrees F, and the frost-free season lasts about 90 to 95 days.

This unit makes up about 9 percent of the area. It is about 35 percent LaJara soils, 20 percent Mogote soils, 20 percent LaSauses soils, and 10 percent poorly drained Vastine soils. The remaining 15 percent is made up of the somewhat poorly drained Lamanga soils, the poorly drained Alamosa soils, and poorly drained, saline-alkali Nortonville soils.

LaJara soils, which are on flood plains and low terraces, typically are poorly drained. They support meadow grasses and shrubs. The surface layer is loam and sandy loam. The subsoil is sandy loam, and the substratum is thinly stratified sandy loam to sand. The seasonal water table is within a foot of the surface. It is subject to frequent overflow during the spring runoff period.

Mogote soils, which are on flood plains and low terraces, typically are somewhat poorly drained. They support meadow grasses and shrubs. The surface layer and upper part of the underlying material are loam over sand and gravel. The seasonal water table is within 2 to 3 1/2 feet of the surface during the irrigation season.

LaSauses soils, which are on flood plains, typically are somewhat poorly drained and salt- and alkali-affected. They support meadow grasses and shrubs. The surface layer is sandy clay loam and clay loam. The subsoil is heavy clay loam. The substratum is stratified heavy clay loam and loam over sand and gravel. The seasonal water table is within one-half to 2 feet of the surface during the irrigation season.

This unit is mainly irrigated meadow and cropland. Wetness is the major limitation for crops and most other uses. Flooding, which is common on some soils during the spring runoff period, also limits the use of this unit.

2. Quamon-LaJara-Shawa

Nearly level, deep, moderately well drained and poorly drained soils on flood plains, terraces, and alluvial fans

This map unit occurs along the Conejos and Alamosa Rivers in the central part of the survey area. It consists of soils developed in mixed alluvium derived mainly from igneous rock at elevations of 7,600 to 8,400 feet. The average annual precipitation is about 8 to 12 inches, the mean annual air temperature is about 41 or 42 degrees F, and the frost-free season lasts about 95 days.

This unit makes up about 2 percent of the area. It is about 30 percent Quamon soils, 20 percent LaJara soils, and 15 percent wet Shawa soils. The remaining 35 percent is made up of Aquolls, Aquents, and Aquic Ustorthents.

Quamon soils, which typically are on terraces, are moderately well drained and support narrowleaf cottonwood and an understory of grasses and shrubs. The surface layer and upper part of the underlying material are loam. The lower part of the underlying material is sand and gravel. The seasonal water table is within 3 to 5 feet of the surface during the irrigation season.

LaJara soils, which typically are on flood plains, are poorly drained. They support meadow grasses. The surface layer is loam and sandy loam over stratified sandy loam to sand underlying material. The seasonal water

table is within 1 foot of the surface during spring and early in summer. These soils are subject to frequent flooding during the spring runoff period.

The wet Shawa soils, which typically are on alluvial fans and low terraces, support range grasses and shrubs. Normally, they are well drained, but have a seasonal water table within 2 to 4 feet of the surface during the irrigation season due to excessive seepage from irrigation ditches. The surface layer is loam and clay loam over loam underlying material. The soils are subject to occasional flooding during the runoff period.

This unit is mainly irrigated pasture and hayland. Wetness and flooding are the major limitations for crops and most other uses.

3. San Arcacio-Zinzer

Nearly level to gently sloping, deep, well drained and moderately well drained soils on alluvial fans, terraces, and flood plains

This map unit occurs in the northern part of the survey area. It consists of soils developed in mixed alluvium, derived mainly from igneous rock at elevations of 7,500 to 7,800 feet. The average annual precipitation is about 7 inches, the mean annual air temperature is about 41 degrees F, and the frost-free season lasts about 95 days.

This unit makes up about 4 percent of the area. It is about 50 percent San Arcacio soils and 25 percent Zinzer soils. The remainder is made up of Acacio, Platoro, Graypoint, and McGinty soils.

San Arcacio soils, which are on terraces and flood plains, typically are moderately well drained. Uncultivated areas support meadow grasses and shrubs. The surface layer is sandy loam. The subsoil is sandy clay loam, and the substratum is sand and gravel. The water table is within 3 to 4 feet of the surface during the irrigation season.

Zinzer soils, which are on alluvial fans and terraces, typically are well drained. Uncultivated areas support range grasses and shrubs. The surface layer is loam. The upper part of the underlying material is loam, and the lower part is clay loam and sandy clay loam.

This unit is mainly irrigated cropland, but some areas are native range. The moderate depth to the water table in the San Arcacio soils is the major soil limitation for urban development. Irrigation water must be applied carefully to this unit to prevent seepage and salt buildup. Maintenance of the vegetative cover on rangeland helps prevent soil erosion.

4. Hooper

Nearly level, deep, well drained, saline-alkali affected soils on flood plains

This map unit occurs in the northeast part of the survey area. It consists of soils developed in alluvium derived principally from igneous rock at elevations of 7,500 to 7,800 feet. The average annual precipitation is about 7 inches, the mean annual air temperature is about 41 degrees F, and the frost-free season lasts about 95 days.

This unit makes up about 2 percent of the survey area. It is about 80 percent Hooper soils and 20 percent Corlett, Arena, and other similar soils.

Hooper soils typically support meadow grasses and shrubs. Typically, they are well drained, but some areas have a seasonal water table at depths of 4 to 6 feet. The surface layer is clay loam. The subsoil is heavy clay loam. The upper part of the substratum is sandy clay loam, and the lower part is sand and gravel.

These soils are used as range. The very low available water capacity and saline-alkali condition are the dominant limitations for cropland and rangeland. Maintenance of the vegetative cover on rangeland helps prevent erosion. The clayey texture, shrink-swell potential, and very slow permeability are the main soil limitations for urban uses.

5. Graypoint

Nearly level to very gently sloping, deep, well drained soils on alluvial fans and terraces

This map unit occurs in the east-central part of the survey area. It consists of soils formed in alluvium, principally derived from basalt, at elevations of 7,600 to 7,800 feet. The average annual precipitation is about 7 inches, the mean annual air temperature is about 41 degrees F, and the frost-free season lasts about 95 days.

This unit makes up about 20 percent of the area. It is about 55 percent Graypoint soils, 10 percent Platoro soils, and 35 percent other similar soils.

Graypoint soils typically support range grasses and shrubs. They are typically well drained, but some areas have a seasonal water table within 1 1/2 to 2 feet of the surface because of seepage from irrigation ditches. The surface layer is gravelly sandy loam. The subsoil is gravelly sandy clay loam, and the substratum is sand and gravel.

This unit is used mainly for irrigated crops, irrigated pasture and hayland, and range.

The low available water capacity is the main limitation for cropland and rangeland. Maintenance of the vegetative cover on rangeland helps prevent erosion. Excessive seepage from the gravelly substratum is the greatest soil limitation for urban development where this soil is used for septic tank absorption fields.

6. McGinty-Derrick

Nearly level to moderately sloping, deep, well drained soils on alluvial fans and terraces

This map unit is mainly in the northeastern part of the survey area. It consists of soils developed in alluvium derived mainly from basalt at elevations of 7,600 to 8,000 feet. The average annual precipitation is about 7

inches, the mean annual air temperature is about 41 degrees F, and the frost-free season lasts about 95 days.

This unit makes up about 3 percent of the survey area. It is about 45 percent McGinty soils, 40 percent Derrick soils, and 15 percent Mosca soils.

The gently sloping to moderately sloping McGinty soils are on alluvial fans. They support range grasses and shrubs. They are typically well drained, but some areas have a seasonal water table at a depth of 4 to 6 feet during the irrigation season. The surface layer is sandy loam. The underlying material is sandy loam and gravelly sandy loam.

The nearly level and gently sloping, well drained Derrick soils are on alluvial fans and terraces. They support range grasses and shrubs. The surface layer is very cobbly sandy loam. The subsoil is very gravelly clay loam. The substratum is very cobbly sandy loam and very gravelly sand.

This unit is mainly range for livestock and wildlife. Some areas are in irrigated crops. The low available water capacity is the main limitation for cropland and rangeland. Maintenance of the vegetative cover on rangeland helps prevent erosion. Excessive seepage is the greatest soil limitation for urban development where this soil is used for septic tank absorption fields.

7. Travelers-Garita

Nearly level to moderately steep, shallow to deep, somewhat excessively drained and well drained soils on alluvial fans, terraces, ridges, mesas, and hills

This map unit occurs mainly in the southeast part of the survey area and also in a band along the western edge of the valley floor. It consists of soils developed in alluvium and material weathered from basalt. Elevations are 7,500 to 8,500 feet. The average annual precipitation ranges from about 7 to 9 inches, the mean annual air temperature is about 41 degrees F, and the frost-free season lasts about 90 to 95 days.

This unit makes up about 42 percent of the survey area. It is about 55 percent Travelers soils, 30 percent Garita soils, and 15 percent inclusions of Luhon soils and rock outcrop.

Travelers soils typically are gently sloping to moderately steep, shallow, and somewhat excessively drained soils on ridges, mesas, and hills. They support range grasses and shrubs. The surface layer is very stony loam. The subsoil is very stony loam. The substratum is very stony loam over basalt at about 10 to 20 inches.

Garita soils typically are nearly level to moderately steep, deep, well drained soils on alluvial fans and terraces. They support range grasses and shrubs. The surface layer is cobbly loam. The underlying material is very cobbly loam.

This unit is range for livestock (fig. 3) and wildlife. Maintenance of the plant cover helps prevent erosion. The very low available water capacity and very stony surface are the main limitations for most uses of the Travelers soils. The shallow depth to bedrock is also a major limitation for urban development. Slope and the large amount of coarse fragments are also limitations in this unit.

8. Ryan Park

Gently sloping, deep, well drained soils on alluvial fans

This map unit occurs in the eastern part of the survey area along the Rio Grande River. It consists of soils formed in mixed alluvium at elevations of 7,600 to 7,900 feet. The average annual precipitation is about 7 inches, the mean annual air temperature is about 41 degrees F, and the frost-free season lasts about 95 days.

This unit makes up about 2 percent of the survey area. It is about 50 percent Ryan Park soils, 10 percent Space City soils, and 40 percent inclusions of McGinty, Travelers, and Garita soils.

Ryan Park soils typically support range grasses and shrubs. The surface layer and subsoil are sandy loam. The substratum is loamy sand and sandy loam.

This unit is range for livestock and wildlife. Maintenance of the vegetative cover helps prevent erosion. This unit is subject to wind erosion where plant cover is removed.

Soils on hills, mountains, mesas, and intermingled fans and terraces

These are gently sloping to very steep, well drained, deep to shallow soils. These soils occur mainly in the extreme western edge of Conejos County and in a small area on the eastern edge of the county. There are three map units in this group of soils. They make up about 16 percent of the Conejos County Area.

9. Cumbres-Empedrado-Curecanti

Gently sloping to steep, moderately deep to deep, well drained soils on hills, mountains, alluvial fans, and terraces

This map unit occurs along the foothills of the western part of the survey area. It consists of soils developed in material weathered from igneous rock and alluvium from rhyolite, andesite, and mixed sources. Elevations range from 8,000 to 9,300 feet. The average annual precipitation is about 15 inches, the mean annual air temperature is about 40 degrees F, and the frost-free season lasts about 80 to 90 days.

This unit makes up about 6 percent of the area. It is about 35 percent Cumbres soils, 25 percent Empedrado soils, 20 percent Curecanti soils, 5 percent rock outcrop, and 15 percent minor soils.

Cumbres soils typically are gently to moderately sloping, moderately deep soils formed on hills, ridges, and mountainsides in material weathered from igneous rock. They support range grasses and shrubs. The surface

layer is very stony loam. The subsoil is very stony and extremely stony heavy clay loam. The substratum is extremely stony sandy loam over basalt at a depth of 20 to 40 inches.

Empedrado soils typically are sloping to steep, deep soils on upland hills and alluvial fans in alluvium from rhyolite and andesite. They support thin stands of pinyon pine and juniper and an understory of range grasses and shrubs. The surface layer is loam. The subsoil is sandy clay loam, and the substratum is loam and sandy loam.

Curecanti soils typically are sloping to steep, deep soils formed in alluvial fans and terraces in mixed alluvium. They support thin stands of pinyon pine and juniper and an understory of range grasses and shrubs (fig. 4). The surface layer is very cobbly loam. The subsoil is very cobbly sandy clay loam, and the substratum is very cobbly loamy sand.

This unit provides summer range for livestock and wildlife habitat. Trees are cut for fence posts and firewood in some wooded areas. Maintenance of good vegetative cover is essential to prevent soil erosion. Depth to bedrock in the Cumbres soils and large stones in the Cumbres soils and Curecanti soils are the main soil limitations for most uses.

10. Bushvalley-Miracle-Youga

Moderately sloping to steep, shallow to deep, well drained soils on mountains, ridges, and mesas

This map unit occurs in the western part of the survey area. It consists of soils developed in colluvium and outwash from igneous rock and conglomerate of the Santa Fe Formation at elevations above 8,400 feet. The average annual precipitation ranges from about 13 to 18 inches, the mean annual air temperature is about 38 or 39 degrees F, and the frost-free season lasts about 60 to 80 days.

This unit makes up about 6 percent of the area. It is about 35 percent Bushvalley soils, 20 percent Miracle soils, and 15 percent Youga soils. The remainder is made up of Jerry soils, Cryaquolls, Histosols, and rock outcrop.

Bushvalley soils, which typically are shallow, developed in colluvium from igneous rock. They support ponderosa pine. The surface layer is very stony. The subsoil is very cobbly sandy clay loam and extremely cobbly clay loam over rhyolite at a depth of 7 to 20 inches.

Miracle soils, which typically are moderately deep, developed in outwash material from igneous rock and colluvium from conglomerate. They support pinyon pine, juniper, and understory shrubs and grasses. The surface layer is loam. The subsoil is sandy clay over conglomerate at a depth of 20 to 40 inches.

Youga soils, which typically are deep, developed in outwash material from igneous rock. They support grasses and shrubs. The surface layer is loam. The subsoil and substratum are clay loam over rhyolite at a depth of 40 to 60 inches.

This unit provides summer range for livestock (fig. 5), timber production, spring and fall habitat for deer and elk, and recreation. Stoniness, slope, and shallow soil depth are the dominant soil limitations for most uses. Commercial timber production is limited to the shallow and stony Bushvalley soils. Yields are generally low. Logging roads and trails should be constructed with care to prevent erosion. Maintenance of the vegetative cover on rangelands also helps prevent erosion.

11. Seitz

Strongly sloping to very steep, deep, well drained soils on mountains and ridges

This map unit occurs in the western part of the survey area. It consists of soils developed in colluvium from igneous rock at elevations of 9,600 to 11,000 feet. Vegetation is dominantly Engelmann spruce. The average annual precipitation is about 18 inches, the mean annual air temperature is about 35 degrees F, and the frost-free season lasts about 60 days.

This unit makes up about 4 percent of the area. It is about 75 percent Seitz soils, 15 percent rock outcrop, and 10 percent Bushvalley soils.

Seitz soils typically have a thin organic layer of needles and twigs over very stony loam surface and subsurface layers. The substratum is very stony clay loam.

This unit is used mainly for timber production, limited livestock grazing, and wildlife habitat. Stoniness and slope are the dominant soil limitations for most uses. Care is needed in use of equipment and in construction of logging trails and roads to prevent erosion.

Broad land use considerations

Deciding which land to use for urban development is becoming an important issue in the survey area. Although the amount of subdivided land is relatively small in Conejos County, there is significant land subdivision and sales in nearby Costilla County, and future land subdivision within the survey area needs to be considered in broad land use planning. The general soil map is helpful in planning the general outline of urban areas, but the detailed soil descriptions should be used in selecting sites for specific urban structures.

Areas where the soils are unfavorable for urban development are moderately extensive. Large portions of the Quamon-LaJara-Shawa map unit are on flood plains where flooding and ponding are severe limitations. A high water table and seepage are severe limitations for sewage disposal systems in the LaJara-Mogote-La-Sauses map unit and in some irrigated areas of the San Arcacio-Zinzer map unit. Many steep soils in the Bushvalley-Miracle-Youga map unit and the Seitz map unit have hard bedrock a foot or two below the surface,

which makes urban development costly. Many soils in the Travelers-Garita map unit are shallow and very stony.

In some areas the soils have good potential for farming but fair or poor potential for nonfarm uses. These are, for the most part, the map units 1, 3, 5, and 6 on the general soil map. In these units the dominant soils are LaJara, San Arcacio, Graypoint, and McGinty. High water table and wetness are limitations for nonfarm uses on most areas of these soils. The soils have good potential for farming, however, and many farmers have provided sufficient drainage for crops.

The potential for woodland is good or fair in the Quamon-LaJara-Shawa map unit, which supports cottonwood, and in the Seitz map unit, which supports coniferous forest. Most areas within these units are suited to commercial timber production.

The Bushvalley-Miracle-Youga map unit has good potential for parks and extensive recreation areas. Small lakes and marshes within this unit are good nature study areas. They provide habitat for waterfowl and other important wildlife.

Soil maps for detailed planning

The map units shown on the detailed soil maps at the back of this publication represent the kinds of soil in the survey area. They are described in this section. The descriptions together with the soil maps can be useful in determining the potential of a soil and in managing it for food and fiber production; in planning land use and developing soil resources; and in enhancing, protecting, and preserving the environment. More information for each map unit, or soil, is given in the section "Use and management of the soils."

Preceding the name of each map unit is the symbol that identifies the soil on the detailed soil maps. Each soil description includes general facts about the soil and a brief description of the soil profile. In each description, the principal hazards and limitations are indicated, and the management concerns and practices needed are discussed.

The map units on the detailed soil maps represent an area on the landscape made up mostly of the soil or soils for which the unit is named. Most of the delineations shown on the detailed soil map are phases of soil series.

Soils that have profiles that are almost alike make up a *soil series*. Except for allowable differences in texture of the surface layer or of the underlying substratum, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement in the profile. A soil series commonly is named for a town or geographic feature near the place where a soil of that series was first observed and mapped. The LaJara series, for example, was named for the town of La Jara in Conejos County.

Soils of one series can differ in texture of the surface layer or in the underlying substratum and in slope, erosion, stoniness, salinity, wetness, or other characteristics that affect their use. On the basis of such differences, a soil series is divided into phases. The name of a *soil phase* commonly indicates a feature that affects use or management. For example, Shawa loam, wet, is one of several phases within the Shawa series.

Some map units are made up of two or more dominant kinds of soil. Such map units are called soil complexes.

A *soil complex* consists of areas of two or more soils that are so intricately mixed or so small in size that they cannot be shown separately on the soil map. Each area includes some of each of the two or more dominant soils, and the pattern and proportion are somewhat similar in all areas. The Dunul-Lamanga complex is an example.

Most map units include small, scattered areas of soils other than those that appear in the name of the map unit. Some of these soils have properties that differ substantially from those of the dominant soil or soils and thus could significantly affect use and management of the map unit. These soils are described in the description of each map unit. Some of the more unusual or strongly contrasting soils that are included are identified by a special symbol on the soil map.

Most mapped areas include places that have little or no soil material and support little or no vegetation. Such places are too small to be delineated and are identified by a special symbol on the soil map.

The acreage and proportionate extent of each map unit are given in table 4, and additional information on properties, limitations, capabilities, and potentials for many soil uses is given for each kind of soil in other tables in this survey. (See "Summary of tables.") Many of the terms used in describing soils are defined in the Glossary.

Soil descriptions

1—Acacio sandy loam. This is a deep, well drained soil on flood plains and old alluvial terraces at elevations of 7,500 to 7,800 feet. It formed in mixed alluvium derived mainly from basalt or similar ferromagnesian-rich rock. The average annual precipitation is about 7 inches, the average annual air temperature is about 41 degrees F, and the average frost-free period lasts about 95 days. Slopes are 0 to 1 percent.

Included in mapping are small areas of Zinzer loam and McGinty sandy loam.

Typically, the surface layer is grayish brown sandy loam about 4 inches thick. The subsoil is yellowish brown and brown clay loam and loam about 10 inches thick. The lower part of the subsoil has visible carbonates and small salt spots. The substratum is very pale brown and pale brown loam containing visible lime and many fine gypsum crystals.

Permeability is moderate. Available water capacity is moderate. Runoff is slow, and the erosion hazard is slight. Effective rooting depth is 60 inches or more.

This soil is used for irrigated crops, irrigated pasture or hay, and range. All locally adapted crops can be grown. This soil is especially well suited to small grains and alfalfa. Good management includes a cropping system with a high-residue crop, a deep-rooted legume in the rotation, and applications of fertilizer for maintaining good tilth and adequate growth.

This soil is suited to border and furrow irrigation. Leveling and smoothing make irrigation easier and more efficient. Good management of irrigation water is necessary to prevent seepage and salt accumulation. Legumes respond to phosphorus, and nonlegumes respond to nitrogen and phosphorus fertilizers.

If used for pasture or permanent hay, this soil produces well under intensive management. It is suited to such adapted grasses as smooth brome, orchardgrass, intermediate wheatgrass, or timothy mixed with alfalfa, red clover, or alsike clover.

The potential native vegetation is dominated by alkali sacaton. Alkali cordgrass, western wheatgrass, greasewood, rabbitbrush, and inland saltgrass are prominent but widely spaced. If the range deteriorates, the proportion of desirable grasses, such as alkali sacaton and western wheatgrass, decreases and the proportion of greasewood, rabbitbrush, and inland saltgrass increases. Undesirable weeds and annual plants invade and become abundant if the range condition becomes poorer.

Unless irrigated, seeding is not advisable because of the low rainfall. Deferred grazing, cross fencing, stockwater development, and brush control help prevent range deterioration and promote growth of desirable plant species.

This soil provides a habitat best suited to rangeland wildlife, such as antelope, cottontail, coyote, and jackrabbit. Range production is typically low, and livestock grazing needs to be managed properly if wildlife and livestock share the range. Livestock watering facilities are used by a variety of wildlife. Where this soil is irrigated, openland wildlife can be encouraged if food and cover are provided.

The Acacio soil is generally not suited to windbreak and environmental plantings. Onsite investigation is needed to determine if plantings are feasible.

Soil limitations for urban development are the high gypsum concentrations and low bearing strength. Special building designs and use of Type II cement help overcome these limitations. The capability subclasses are IIIs irrigated and VIIs nonirrigated.

2—Alamosa loam. This is a deep, poorly drained soil on flood plains along the Rio Grande River and lower Conejos River at elevations of 7,500 to 8,000 feet. It formed in mixed alluvial sediments. The average annual precipitation is about 7 inches, the average annual air temperature is about 41 degrees F, and the average frost-free period lasts about 95 days. Slopes are 0 to 1 percent.

Included in mapping are small areas of Nortonville loam and Vastine loam.

Typically, the surface layer is grayish brown loam about 6 inches thick. The subsoil is grayish brown and pale brown clay loam about 32 inches thick. The substratum, below a depth of 38 inches, is yellowish brown loamy sand. Mottles are common in the lower part of the subsoil and in the substratum.

Permeability is moderately slow. Available water capacity is high. Runoff is slow, and erosion hazard is slight. Wetness makes this soil moderately difficult to work. Effective rooting depth is 60 inches or more. The water table is within 1 to 1 1/2 feet of the surface in spring and early in summer most years. The soil is subject to frequent flooding during the spring runoff period.

This soil is used for alfalfa, small grains, meadow hay, and range. Potatoes do not grow well on this soil because of inadequate drainage. Alfalfa and small grains may be damaged when the water table is high or as a result of flooding.

Border and sprinkler irrigation methods are suitable. Leveling helps in the management of irrigation water. Runs can be longer on this soil than on sandier soils, but the amount of water applied and the length of time it is applied, need to be reduced to keep down seepage. Maintenance of fertility and good tilth is important. Nonlegumes grown on this soil respond to applications of nitrogen and phosphorus, and legumes respond to phosphorus. This soil is difficult to drain, although drainage generally is necessary for good crop production. Outlets for drains generally are not available.

If used for pasture and hay, this soil is suited to most adapted grasses, such as smooth brome, timothy, intermediate wheatgrass, or alta fescue. Sweetclover, red clover, or alsike are suitable legumes.

The potential native vegetation is dominated by alkali sacaton, western wheatgrass, slender wheatgrass, sedges, and rushes. Greasewood, willow, and cinquefoil are sparse. If the range deteriorates, the proportion of desirable forage species decreases and the proportion of sedges, rushes, greasewood, and cinquefoil increases. Undesirable weeds and annual plants invade and become abundant if the range condition becomes poorer.

Range seeding is generally not advisable because of the wetness and the high cost of land preparation. Control of excess water, renovating, deferred and rotation grazing, cross fencing, and brush control help prevent range deterioration and promote the growth of desirable plant species.

Wet areas of this soil are well suited to shallow water developments, which encourage wetland wildlife such as waterfowl and shorebirds. Because of the availability of

water, this soil provides excellent waterfowl nesting cover.

Rangeland wildlife, such as deer and cottontail, use the excellent cover provided by willows, rushes, and other wetland vegetation on this soil. Wildlife can best be aided by proper livestock grazing and by allowing natural vegetation, such as willows, to develop.

The primary soil limitations for urban development are the high water table, limited load bearing strength, frost heave hazard, and spring flooding. Dwellings and road designs can be modified to offset the soil's inherent limited ability to support a load. Sewage systems other than septic tanks are needed to avoid contamination of ground water. Dikes or levees may be necessary to prevent seasonal flooding. The capability subclasses are IVw irrigated and Vw nonirrigated.

3—Aquic Ustorthents, gravelly. This undifferentiated unit consists of deep, somewhat excessively drained soils on nearly level alluvial flood plains and low terraces along major streams at elevations of 7,600 to 7,800 feet. The average annual precipitation is about 7 inches, the average annual air temperature is about 41 degrees F, and the frost-free season lasts about 95 days. Slopes are 0 to 1 percent. The composition of this unit is generally more variable than that of most other map units in the area. Mapping has been controlled well enough, however, for the anticipated use.

Typically, the soil profile varies considerably from place to place. The surface layer is generally gravelly sandy loam or very gravelly loamy sand ranging from about 8 to 20 inches thick. The underlying material is generally sand and gravel that extends to a depth of 60 inches or more.

Runoff is slow, and the erosion hazard is slight. The soils may be flooded for short periods during spring runoff when streams are high. A seasonal high water table is generally within 1 to 2 feet of the surface during spring runoff periods.

These soils are mainly in native range. Some small areas included in larger areas of other soils are irrigated pasture and hayland.

The potential native vegetation is dominated by western and slender wheatgrasses in the drier areas and by tufted hairgrass, bluejoint and northern reedgrasses, and Nebraska sedge in the wetter areas. If the range deteriorates, the proportion of these more desirable plants decreases and the proportion of less desirable plants such as rushes, forbs, and woody shrubs increases. Undesirable weeds and annuals invade and become abundant if the range condition becomes poorer.

These soils are also suited to narrowleaf cottonwood (fig. 6). They are capable of producing 7,000 board feet (Doyle Rule) of merchantable timber per acre from a fully stocked, even-aged stand of 40-year-old trees. The primary restriction for wood crop production is periodical high water.

These soils provide habitat for wetland wildlife, especially waterfowl. The availability of moisture allows production of wetland plants that provide nesting and protective cover, as well as some food, for waterfowl. Nearby irrigated croplands also provide food and cover for wetland wildlife.

Developments to increase wetland wildlife populations include excavations and blasting potholes to provide open-water areas. Livestock grazing should be carefully managed to maintain waterfowl nesting cover.

The flooding hazard and seasonal high water table are major limitations for urban development. Building on these soils would require soil drainage and protection from flooding. Septic tank systems are not suited to these soils and may cause pollution of underground water and nearby streams. The capability subclass is VIIw.

4—Aquolls and Aquents, frequently flooded. These nearly level soils formed in alluvium on flood plains and low terraces along major streams. They occur at elevations between about 7,500 to 8,000 feet. The average annual precipitation is about 7 inches, the mean annual air temperature is about 41 degrees F, and the frost-free period lasts about 95 days. Slopes are 0 to 1 percent. The composition of this unit is generally more variable than that of most other map units in the area. Mapping has been controlled well enough, however, for the anticipated use.

The Aquolls make up about 60 percent of the map unit, the Aquents about 30 percent, and soils that are shallow and very shallow over gravel about 10 percent.

The Aquolls are typically deep, dark, poorly drained soils formed in alluvium from mixed sources. The surface layer is dark brown or black loam or clay loam and varies in thickness. The subsoil is mottled and highly stratified. It ranges from sandy loam to clay loam.

The Aquents are typically deep, light-colored, poorly drained soils formed in alluvium from mixed sources. The surface layer is light-colored loam or clay loam that varies in thickness. The underlying material is stratified and mottled. It ranges from sandy loam to clay loam.

Runoff is slow, and the erosion hazard is slight. These soils are frequently flooded during periods of high runoff. The water table is about 1/2 to 2 1/2 feet below the surface during the growing season.

These soils are used for irrigated pasture and hayland, irrigated crops, range, and wildlife habitat.

Small grains and alfalfa are suited to areas that are drained and protected from flooding. Potatoes and other vegetable crops are not suited. Leveling is necessary for proper irrigation water management. Applications of commercial fertilizer and manure are needed, and plant residues should be returned to the soil in the irrigated areas.

The potential native vegetation is dominated by alkali sacaton, western wheatgrass, willows, sedges, and rushes. Greasewood, rabbitbrush, and cinquefoil are

present but widely spaced. If the range deteriorates, the proportion of desirable forage species decreases and the proportion of sedges, rushes, greasewood, and cinquefoil increases. Undesirable weeds and annual plants invade and become more abundant if the range condition becomes poorer.

Seeding is generally not advisable because of wetness and the high cost of land preparation. Control of excess water, renovating, deferred and rotation grazing, cross fencing, and brush control are practices that prevent range deterioration and promote the growth of desirable plant species.

Open water areas created by excavation or pothole blasting are well suited to shallow water developments. Developments such as these increase waterfowl and shorebird populations. Because of the availability of moisture, these soils provide excellent waterfowl nesting cover if livestock grazing is carefully managed.

The most limiting soil features for urban development are the high water table and flooding hazard. Caving of cutbanks is a hazard when excavating. Where these soils are used for septic tank systems and sanitary landfills, there is a hazard of ground water contamination due to the high water table and flooding hazard. The capability subclasses are IVw irrigated and Vw nonirrigated.

5—Arena loam. This is a moderately deep, poorly drained saline-alkali soil on old alluvial flood plains at elevations of 7,500 to 7,800 feet. It formed in mixed alluvium. The average annual precipitation is about 7 inches, the average annual air temperature is about 41 degrees F, and average frost-free period lasts about 95 days. Slopes are 0 to 1 percent.

Included in mapping are barren areas, or slickspots, where no plants will grow, and small areas of Hooper clay loam and Mosca loamy sand. These included soils make up as much as 50 percent of any one mapped area.

Typically, the surface layer is light gray loam about 2 inches thick. The subsoil is grayish brown clay loam about 28 inches thick. The substratum is light brownish gray silica-cemented hardpan, finely stratified with layers of loamy sand, sandy loam, and sandy clay loam to a depth of 60 inches. A few mottles and lime and other salts are visible in seams and spots.

Permeability is moderately slow above the hardpan and slow through it. Runoff is slow, and the erosion hazard is slight. A water table occurs 1 to 2 feet below the surface. The soil is subject to occasional flooding during the spring runoff period. Effective rooting depth is 20 to 40 inches.

This soil is used mainly for range and wildlife habitat. Alfalfa, barley, and oats can be grown, but drainage, subsoiling, and the addition of gypsum or sulfuric acid are necessary.

Border and sprinkler irrigation methods are suitable. Sprinkler irrigation is suited to most crops. Border irrigation is suited to alfalfa, small grains, and pasture. Regardless of the method used, water must be applied carefully to prevent its perching on the slowly permeable underlying material.

The potential native vegetation on this soil is dominated by alkali sacaton, alkali cordgrass, and inland saltgrass. Greasewood, rabbitbrush, and rush are prominent, but widely spaced. If the range deteriorates, the proportion of desirable grasses such as alkali sacaton and western wheatgrass decreases and the proportion of greasewood, rabbitbrush, and inland saltgrass increases. Undesirable weeds and annual plants invade and become more abundant if the range condition becomes poorer.

Seeding is not advisable because of the low rainfall and alkali condition of the soil. Deferred grazing, cross fencing, stockwater development, and brush control help prevent range deterioration and promote growth of desirable plant species.

Rangeland wildlife, including antelope, jackrabbit, cottontail, horned lark, and lark bunting, are suited to the grassland habitat that develops on this soil. Proper livestock grazing, fencing which allows for free movement of antelope, and livestock water facilities will increase rangeland wildlife populations. Where water is available, shallow water areas can be developed for wetland wildlife species.

The primary soil limitations for urban development are flooding, poor drainage, cemented hardpan, frost action, and relatively low bearing strength. Dwelling and road designs can be modified to offset the frost action and the soil's limited ability to support a load. Sewage systems other than septic tanks are needed to avoid contamination of ground water. Dikes or levees may be necessary to prevent seasonal flooding. The capability subclasses are VIIw nonirrigated and IIIw irrigated.

6—Arena loam, drained. This moderately deep, drained saline-alkali soil is on old alluvial flood plains at elevations of 7,500 to 7,800 feet. It formed in mixed alluvial parent material. The average annual precipitation is about 7 inches, the average annual air temperature is about 41 degrees F, and the average frost-free period lasts about 95 days. Slopes are 0 to 1 percent.

About 10 percent of this unit is Hooper soils and 10 percent is Mosca soil. A few small slickspots, or alkali spots, are also included.

Typically, the surface layer is light gray loam about 2 inches thick. The subsoil is grayish brown clay loam about 28 inches thick. The substratum is light brownish gray silica-cemented hardpan finely stratified with layers of loamy sand, sandy loam, and sandy clay loam to a depth of 60 inches. It has a few mottles, visible lime, and other salts in seams and spots.

Permeability is moderately slow above the hardpan and slow through it. Runoff is slow, and the erosion hazard is slight. A water table occurs 3 1/2 to 5 feet below the surface. Effective rooting depth is 20 to 40 inches.

This soil is used for native range, irrigated pasture and hayland, and wildlife habitat. Alfalfa, barley, tall wheatgrass, and Russian wildrye can be grown by irrigation. Commercial fertilizer should be applied and manure and plant residues used in the irrigated areas. Subsoiling and application of gypsum or sulfuric acid are desirable for good crop production.

The potential native vegetation on this soil is dominated by alkali sacaton, alkali cordgrass, and inland saltgrass. Greasewood, rabbitbrush, and rush are prominent but widely spaced. If the range deteriorates, the proportion of desirable grasses such as alkali sacaton and western wheatgrass decreases and the proportion of greasewood, rabbitbrush, and inland saltgrass increases. Undesirable weeds and annual plants invade and become more abundant if the range condition becomes poorer.

Seeding is not advisable, because of the low rainfall and saline-alkali condition of the soil. Irrigation is necessary for seedling development. Deferred grazing, cross fencing, stockwater development, and brush control help prevent range deterioration and promote growth of desirable plant species.

Rangeland wildlife, including antelope, jackrabbit, cottontail, horned lark, and lark bunting, are suited to the grassland habitat that develops on this soil. Proper livestock grazing, fencing which allows for free movement of antelope, and livestock water facilities will increase rangeland wildlife populations. Where water is available, shallow water areas can be developed for wetland wildlife species.

The greatest limitations to urban development on the soil are flooding, wetness, cemented pan, frost action, and relatively low bearing strength. Dwelling and road designs can be modified to offset frost action and the soil's limited ability to support a load. Sewage systems other than septic tanks need to be used to avoid contamination of groundwater. The capability subclasses are IVw irrigated and VIIw nonirrigated.

7—Bushvalley very stony loam, 10 to 40 percent slopes. This is a shallow, very stony, well drained soil on mountains at elevations of more than 9,000 feet. It formed in thin colluvium over volcanic rock. The average annual precipitation is about 18 inches, the average annual air temperature is about 38 degrees F, and the average frost-free period lasts about 60 days. Slopes are 10 to 40 percent.

Included in mapping are areas of rhyolite outcrop and Youga loam.

Typically, the surface layer is brown very stony loam about 4 inches thick. The subsoil is brown very cobbly sandy clay loam and extremely cobbly clay loam 13 inches thick over rhyolite. Depth to rhyolite ranges from 7 to 20 inches.

Permeability is moderately slow. Available water capacity is very low. Runoff is medium to rapid, and the erosion hazard is high. Effective rooting depth ranges from 7 to 20 inches.

This soil is used for summer range by livestock, for woodland, and for wildlife habitat.

The potential native vegetation is dominated by Arizona fescue, mountain muhly, and Junegrass, with smaller amounts of Parry oatgrass, blue grama, and bluegrasses. If the range deteriorates, the proportion of Arizona fescue and mountain muhly decreases, and the proportion of blue grama, squirreltail, ring muhly, forbs, and woody shrubs increases. Undesirable shrubs, weeds, and annual plants invade and become abundant if the range condition becomes poorer.

Seeding is not advisable because of the stones, slope, and shallow soil. Deferred grazing, cross fencing, and stockwater development are generally needed to prevent range deterioration and permit the growth and increase of desirable plant species.

This soil provides habitat for woodland wildlife such as blue grouse, snowshoe hare, and black bear. It also furnishes summer range for mule deer and elk. Wildlife populations can be increased through proper livestock grazing, which increases the productivity of vaccinium, grasses, and various forbs eaten by deer and elk.

This soil is suited to the production of Ponderosa pine. It is capable of producing about 3,150 cubic feet of wood per acre, or 6,850 board feet (international rule) of merchantable timber from fully stocked, even-aged stand of 80-year-old trees. The primary restrictions for timber production are surface stones, shallow soil depth, and high erosion hazard. The stones interfere with felling, yarding, and other equipment operations. Special attention must be given to keep soil erosion to a minimum during harvest because of the high erosion hazard. The low available water capacity can decrease seedling survival. Some trees may be wind-thrown because of the shallow rooting depth.

Slope, shallow soil, stones, and rock outcrop are limiting soil features that must be considered when planning the construction of houses and roads. Surface runoff must be controlled and soil erosion kept to a minimum. This soil may also require special site or building designs because of the slope. Cutting slopes to provide level building pads may expose the underlying bedrock. The large surface stones can be removed by heavy equipment when preparing building sites and roads. The capability subclass is VIIs.

8—Bushvalley-Youga complex, 3 to 25 percent slopes. These soils occur on mountains at elevations of more than 9,000 feet. The average annual precipitation is about 18 inches, the mean air temperature is about 38 degrees F, and the frost-free season lasts about 60 days. The Bushvalley soil makes up about 60 percent of the map unit, the Youga soil about 25 percent, and rock outcrop about 10 percent.

The Bushvalley soil is shallow, well drained, very stony soil. It formed in colluvium from volcanic rock. Typically,

the surface layer is brown very stony loam about 4 inches thick. The subsoil is 13 inches thick over rhyolite. The upper 10 inches of the subsoil is brown very cobbly sandy clay loam and the lower 3 inches is extremely cobbly clay loam. Depth to rhyolite ranges from 7 to 20 inches.

Permeability is moderately slow. Available water capacity is very low. Runoff is medium to rapid, and the erosion hazard is high. Effective rooting depth ranges from 7 to 20 inches.

The Youga soil is deep and well drained. It formed in glacial till or outwash material. Typically, the surface layer is dark grayish brown loam about 7 inches thick. The subsoil is very dark grayish brown and light brown clay loam about 24 inches thick. The substratum is pinkish gray clay loam about 11 inches thick over fractured rhyolite. Rhyolite is at a depth of about 44 inches.

Permeability is slow. Available water capacity is moderate. Runoff is medium, and the erosion hazard is moderate. The effective rooting depth is 40 to 60 inches.

The potential native vegetation on this complex is dominated by Arizona fescue, mountain muhly, and Parry oatgrass, with smaller amounts of rabbitbrush, blue-grama, and muttongrass. If the range deteriorates, the proportion of Arizona fescue and mountain muhly decreases and the proportion of blue grama, squirreltail, ring muhly, forbs, and woody shrubs increases. Undesirable shrubs, weeds, and annual plants invade and become more abundant if the range condition becomes poorer.

Seeding on this complex is not advisable because of slope, shallow soil, and stones. Deferred grazing, cross fencing, and stockwater facilities are generally needed to prevent range deterioration and permit the growth and increase of desirable plant species.

This complex is used for wildlife habitat and livestock grazing. It provides habitat for blue grouse, snowshoe hare, and black bear. This complex also furnishes range for mule deer and elk. Wildlife populations can be increased through proper livestock grazing, which increases the productivity of grasses and various forbs eaten by deer and elk.

Slope, shallow soil, stones, and rock outcrops are limiting soil features that must be considered when planning the construction of houses and roads. Surface runoff must be controlled and soil erosion kept to a minimum. Buildings may need to be specially designed because of the slope. Deep cutting slopes to provide level building pads may expose the underlying bedrock of the Bushvalley soil. The large surface stones can be removed by heavy equipment when preparing building sites and roads. The capability subclass is VIIs.

9—Corlett-Hooper complex, undulating. These soils occur at elevations between 7,500 and 7,800 feet. The average annual precipitation is about 7 inches, the mean annual air temperature is about 41 degrees F, and the frost-free season lasts 90 to 100 days. The Corlett soil makes up about 60 percent of the map unit, and the Hooper soil makes up about 40 percent. Slopes are 0 to 8 percent.

The Corlett soil is a deep, somewhat excessively well drained, alkali soil. It formed in wind-modified sandy alluvium on low dunes. Typically, the surface layer is light brownish gray loamy fine sand about 8 inches thick. The underlying material is pale brown fine sand that extends to a depth of 60 inches or more. In places, this soil is underlain by finer material at a depth of 40 inches or more and is affected by a water table below a depth of 40 inches.

Permeability is rapid. The available water capacity is low. Runoff is slow, and the soil blowing hazard is high. The effective rooting depth is 60 inches or more.

The Hooper soil is deep and well drained. It formed in alluvium derived principally from volcanic rock. This soil is in low areas between dunes. Typically, the Hooper soil has a light gray loamy fine sand surface layer about 3 inches thick. The subsoil is yellowish brown and very pale brown heavy clay loam about 18 inches thick. The substratum is very pale brown and light gray sandy clay loam about 16 inches thick underlain by sand and gravel to a depth of 60 inches or more.

Permeability is very slow. The available water capacity is low. Runoff is slow, and the erosion hazard is slight, however, there is a moderate hazard of soil blowing. This complex is not suited to cultivation because of the extremely high sodium concentration and the large amounts of gypsum or sulfuric acid required for reclamation. The effective rooting depth is 60 inches or more.

These soils are used for native range and for wildlife habitat. The potential native vegetation is dominated by greasewood, tall rabbitbrush, and fourwing saltbush, with an understory of alkali sacaton and inland saltgrass on the Hooper soil and Indian ricegrass, sand dropseed, and blue grama on the Corlett soil. If the range deteriorates, the proportion of these desirable understory plants decreases and the proportion of brush, inland saltgrass, spiny muhly, and forbs increases. Brush continues to increase and weeds and annual plants invade if the range condition becomes poorer.

Seeding on this complex is not advisable because of the low rainfall, irregular topography, and the presence of salt and alkali. Deferred grazing, cross fencing, brush control, and stockwater facilities are generally needed to prevent range deterioration and promote the growth and increase of desirable plant species.

This complex provides habitat for openland and rangeland wildlife such as jackrabbit, cottontail, coyote, and various rodents. Populations are limited because of low vegetative production. Where wildlife habitat is planned, proper livestock grazing management is necessary.

Limiting soil features for urban development are the high sodium concentrations, shrink-swell potential, and low bearing strength. Dwelling and road designs can be modified to offset shrink-swell potential and the soil's

limited ability to support a load. Gypsum and sulfuric acid can be used as soil amendments to reclaim these alkali soils, but the cost is high. The capability subclass is VIIs nonirrigated.

10—Cryaquolls and Histosols, flooded. These nearly level to gently sloping soils are in wet, boggy, swale areas and mountain meadows at elevations between about 9,000 and 10,500 feet. The average annual precipitation is about 20 inches, the mean annual air temperature is about 35 degrees F, and the frost-free season lasts about 40 to 80 days. Slopes are 0 to 5 percent. The Cryaquolls make up about 50 percent of the map unit, and the Histosols about 50 percent. The composition of this unit is generally more variable than most other map units in the area. Mapping has been controlled well enough, however, for the anticipated use.

The Cryaquolls are deep, poorly drained soils. They formed in mixed alluvium in valley bottoms and swales. Typically, the soil profile varies from place to place. The surface layer is very dark gray clay loam about 4 to 10 inches thick. The underlying material is mottled sand, gravelly loam, clay loam, or clay about 15 to 40 inches thick over mottled sandy loam or loamy sand several feet thick.

Runoff is slow, and the erosion hazard is slight. These soils are subject to flooding during the spring months. The effective rooting depth is 60 inches or more.

The Histosols are poorly drained, organic soils. Typically, the surface layer is black muck that varies in thickness and degree of decomposition. The underlying layers are peat in varying degrees of decomposition overlying sand at a depth of about 34 inches. The water table is within 1 1/2 feet of the surface most of the year. Thin ice layers occur until early summer in most places. The soil is subject to flooding during the spring months.

Permeability is moderately rapid. Available water capacity is high. Runoff is very slow, and erosion hazard is slight.

These soils are used as summer range and for wildlife habitat.

The potential native vegetation is dominated by tufted hairgrass and sedges, with only scattered amounts of rush, wheatgrass, iris, clovers, vetch, and cinquefoils. If the range deteriorates, the proportion of tufted hairgrass decreases, and the proportion of sedges, rush, iris, and cinquefoils, and forbs increases. Undesirable weeds such as yarrow, herbaceous cinquefoil, groundsel, rose, and false-hellebore invade and become abundant if the range condition becomes poorer.

Seeding is not advisable because of wetness and the expense of preparing a seedbed. Deferred grazing, cross fencing, and brush control are generally needed to prevent range deterioration and promote the growth and increase of desirable plant species.

The potential for shallow water facilities on these soils is high due to the high water table. Wetland wildlife, especially waterfowl and shorebirds, could be increased by development of shallow water areas created by excavation or pothole blasting. Livestock grazing should be carefully managed so that the vegetative cover used by waterfowl for nesting is not destroyed.

Flood hazard, wetness, low bearing strength, and frost action are limiting soil features that must be considered when planning the construction of houses and roads. Dwelling and road designs would have to be modified to alleviate the frost action and to offset the soil's limited ability to support a load. The high water table and flooding cause problems with septic tank absorption fields. The capability subclass is VIw.

11—Cumbres very stony loam, 1 to 9 percent slopes. This is a moderately deep, well drained soil on hills, ridges, and mountainsides at 8,000 to 9,300 feet. It formed in material weathered from igneous rock. The average annual precipitation is about 15 inches, the average annual air temperature is about 40 degrees F, and the average frost-free period lasts about 90 days.

Included in mapping are small areas of Travelers very stony loam, 3 to 25 percent slopes; Stummer loam, 0 to 3 percent slopes; and basalt outcrops.

Typically, the surface layer is grayish brown very stony loam about 4 inches thick. The subsoil is brown and light yellowish brown very stony and extremely stony, heavy clay loam about 12 inches thick. The substratum to a depth of about 22 inches is light gray extremely stony sandy loam over basalt.

Permeability is moderately slow. Available water capacity is very low. Runoff is medium, and the erosion hazard is slight to moderate. Effective rooting depth is about 20 to 40 inches.

This soil is used for grazing sheep and cattle and for wildlife habitat.

The potential native vegetation is dominated by western wheatgrass, needleandthread, and Indian ricegrass. If the range deteriorates, the proportion of these desirable plants decreases, and the proportion of blue grama, squirreltail, sand dropseed, forbs, and woody shrubs increases. Undesirable shrubs, weeds, and annual plants invade and become abundant if the range condition becomes poorer.

Seeding is possible. Adapted species are Nordan crested wheatgrass, Siberian wheatgrass, pubescent wheatgrass, western wheatgrass, or Russian wildrye. Plowing or discing and drilling should be done on the contour or across the slope to minimize runoff and soil loss before the grasses become established. Seeding in conjunction with pitting is also advisable. Late summer seedings have proven most successful. Deferred grazing, cross fencing, and stockwater facilities are generally needed to prevent range deterioration and promote the growth of desirable plant species.

This soil provides a habitat best suited to rangeland wildlife, such as antelope, cottontail, coyote, and jackrabbit. Forage production is typically low, and livestock grazing needs to be managed properly if wildlife and live-

stock share the range. Livestock watering facilities are also important and are used by a variety of wildlife.

Large stones throughout the soil profile and depth to bedrock are the major soil limitations for buildings, sanitary facilities, and streets or roads. Designs may be modified or alternate methods of construction may be used to overcome these limitations and to help prevent soil erosion. The capability subclass is VIs nonirrigated.

12—Derrick very cobbly sandy loam, 0 to 1 percent slopes. This is a deep, very cobbly, well drained soil that is less than 20 inches thick over sand, gravel, and cobbles. It occupies alluvial fans and terraces. The average annual precipitation is about 7 inches, the mean annual air temperature is about 41 degrees F, and the frost-free period lasts about 95 days. Slopes are nearly level.

Included in mapping are small areas of Graypoint gravelly sandy loam and Dunul gravelly sandy loam.

Typically, the surface layer is pale brown very cobbly sandy loam about 5 inches thick. The subsoil is yellowish brown very gravelly clay loam about 7 inches thick. The substratum to a depth of about 17 inches is light brownish gray very cobbly sandy loam. Below this is very gravelly sand to a depth of 60 inches.

Permeability is moderate in the subsoil and upper part of the substratum and very rapid in the lower part of the substratum. Available water capacity is low. Runoff is very slow, and the erosion hazard is slight. Effective rooting depth is 60 inches or more.

This soil is used mainly as native range for sheep and cattle. A few areas are irrigated pasture and hayland. Applications of commercial fertilizer as well as manure are needed in the irrigated areas, and plant residue should be returned to the soil.

Irrigation methods suitable for this soil are border irrigation with short lengths of run and sprinkler irrigation.

The potential native vegetation is dominated by Indian ricegrass, blue grama, winterfat, and ring muhly. If the range deteriorates, the proportion of Indian ricegrass decreases and the amounts of blue grama, squirreltail, threeawn, snakeweed, and rabbitbrush increase. Undesirable weeds and annual plants invade and become abundant if the range condition becomes poorer.

Seeding is generally not advisable because of the low rainfall and low available water capacity. Deferred grazing, cross fencing, and stockwater facilities help to prevent range deterioration and promote the growth of desirable plant species.

Wildlife populations are limited on rangeland because of low vegetative production. Openland and rangeland wildlife such as jackrabbit, cottontail, and coyote are best suited to nonirrigated areas. Where wildlife habitat is planned on this sparsely vegetated soil, livestock grazing needs to be managed properly. In irrigated areas, crop residues from oats and barley may be used by ring-necked pheasant, waterfowl, and geese.

This soil is a good source of sand, gravel, and roadfill, but caving of cutbanks is a hazard when excavating. Septic tank systems and sanitary landfills may contaminate ground water because of the very rapid infiltration rate of the substratum. The capability subclasses are IVs irrigated and VIIs nonirrigated.

13—Derrick very cobbly sandy loam, 1 to 3 percent slopes. This is a deep, very cobbly, well drained soil that is less than 20 inches thick over sand, gravel, and cobble. It occupies alluvial fans and terraces along the edge of the valley floor. The average annual precipitation is about 7 inches. The average annual air temperature is about 41 degrees F, and the frost-free period lasts about 95 days. Slopes are nearly level to gently sloping.

Included in mapping are small areas of Graypoint gravelly sandy loam and Dunul gravelly sandy loam.

Typically, the surface layer is pale brown very cobbly sandy loam about 5 inches thick. The subsoil is yellowish brown very gravelly clay loam about 7 inches thick. The substratum to a depth of 17 inches is light brownish gray, very cobbly sandy loam. Below this is very gravelly sand to a depth of 60 inches.

Permeability is moderate in the subsoil and upper part of the substratum and very rapid in the lower part of the substratum. Available water capacity is low. Runoff is slow, and the erosion hazard is slight to moderate. Effective rooting depth is 60 inches or more.

This soil is mainly in native range for sheep and cattle. A few small areas are irrigated pasture and hayland. Commercial fertilizer and manure need to be applied and plant residues returned to the soil in irrigated areas.

Irrigation methods suitable for this soil are contour ditches, border irrigation with short lengths of run, and sprinklers. Sprinkler irrigation is best for efficient use of water and fertilizers and preventing erosion.

The potential native vegetation on this soil is dominated by Indian ricegrass, blue grama, winterfat, and ring muhly. If the range deteriorates, the proportion of Indian ricegrass decreases and the amounts of blue grama, squirreltail, threeawn, snakeweed, and rabbitbrush increases. Undesirable weeds and annual plants invade and become abundant if the range condition becomes poorer.

Seeding is generally not advisable because of the low rainfall and low available water capacity. Deferred grazing, cross fencing, and stock water facilities help to prevent range deterioration and promote the growth of desirable plant species.

This soil is not suitable for wildlife when used as range because of its low vegetative production. Openland and rangeland wildlife such as jackrabbit, cottontail, and coyote are best suited to nonirrigated areas. Where wildlife habitat is planned on these sparsely vegetated soils, livestock grazing needs to be managed properly. In irrigated areas, crop residues from oats and barley may be used by ring-necked pheasant, waterfowl, and geese.

This soil is a good source of sand, gravel, and roadfill but caving of cutbanks is a hazard when excavating. Septic tank systems and sanitary landfills may contaminate ground water because of the very rapid infiltration rate of the substratum. The capability subclasses are IVs irrigated and VIIs nonirrigated.

14—Dunul gravelly sandy loam. This is a deep, well drained or somewhat excessively drained soil on alluvial fans and terraces at elevations of 7,600 to 8,000 feet. It formed in very gravelly alluvium derived from mixed sources. The average annual precipitation is about 7 inches, the average annual air temperature is about 41 degrees F, and the average frost-free period lasts about 95 days. Slopes are 0 to 3 percent.

About 15 percent of this unit is Graypoint soil and 10 percent is Derrick soil.

Typically, the surface layer is pale brown gravelly sandy loam about 7 inches thick. The underlying material is pale brown very cobbly loamy sand and very cobbly sand to a depth of 60 inches or more.

Permeability is very rapid. Available water capacity is very low. Runoff is slow, and the erosion hazard is slight. Effective rooting depth is 60 inches or more.

This soil is used for native range, but yields are low because of the limited rainfall and very low available water capacity. The soil is also used as irrigated pasture and hayland. Plant residues, manure, and commercial fertilizers are needed at frequent intervals to maintain productivity. Nonlegumes respond to nitrogen fertilizers, and legumes respond to phosphate fertilizer. Gravel and cobbles limit the type of machinery used for tillage of this soil.

The potential native vegetation is dominated by Indian ricegrass, blue grama, and squirreltail. If the range deteriorates, the proportion of Indian ricegrass decreases and the amounts of blue grama, squirreltail, threeawn, snakeweed, and rabbitbrush increase. Undesirable weeds and annual plants invade and become abundant if the range condition becomes poorer.

Seeding is generally not advisable because of the low rainfall and very low available water capacity. Deferred grazing, cross fencing, and stock water facilities help to prevent range deterioration and promote the growth of desirable plant species.

Wildlife on this soil includes openland and rangeland species such as jackrabbit, cottontail, coyote, and various rodents. Wildlife populations are limited where it is used as range and not irrigated. Creating wildlife habitat on this soil requires proper livestock grazing management. In irrigated areas, crop residues from alfalfa, barley, and oats may be used by pheasants, waterfowl, and geese.

Limitations for urban development include rapid water movement through the soil and caving. There is a risk of ground water pollution where the soil is used for septic tank absorption fields or sewage lagoons. Caving is a hazard during excavation. The capability subclasses are IVs irrigated and VIIs nonirrigated.

15—Dunul-Lamanga complex. These are deep, well drained soils on alluvial terraces at elevations of about 7,800 to 8,000 feet. The average annual precipitation is about 7 inches, and the mean annual air temperature is about 41 degrees F. Slopes are 0 to 3 percent. The Dunul soil makes up about 50 percent of the map unit and the Lamanga soil about 30 percent. About 20 percent of the unit is Graypoint gravelly sandy loam and Derrick cobbly sandy loam.

The Dunul soil is a deep, well drained, gravelly soil. It formed in very gravelly alluvium. Typically, the surface layer is a pale brown gravelly sandy loam about 7 inches thick. The underlying material is pale brown very cobbly loamy sand and very cobbly sand to a depth of 60 inches or more.

Permeability is very rapid. The available water capacity is very low. Runoff is slow, and the erosion hazard is slight. The effective rooting depth is 60 inches or more.

The Lamanga soil in this complex is deep and somewhat poorly drained. It formed in mixed alluvium and occurs as slight depressions within the map unit. Typically, the surface layer is brown sandy clay loam about 6 inches thick. The subsoil is brown and light brownish gray clay loam about 13 inches thick. The substratum is brown gravelly sandy loam to a depth of 60 inches or more.

Permeability is moderately slow. Available water capacity is high. Runoff is slow, and erosion hazard is slight. The water table is about 1 1/2 to 3 feet below the surface during the summer months. Effective rooting depth is 60 inches or more.

These soils are mainly in native range. A few small areas are within irrigated pastures and hayland.

The potential native vegetation on this soil is dominated by Indian ricegrass, western wheatgrass, needleandthread, blue grama, winterfat, and fourwing saltbush. If the range deteriorates, the proportion of Indian ricegrass, needleandthread, and western wheatgrass decreases, and the amounts of blue grama, squirreltail, threeawn, snakeweed, and rabbitbrush increases. Undesirable weeds and annual plants invade and become abundant if the range condition becomes poorer.

Seeding is generally not advisable because of the low rainfall and very low available water capacity of the Dunul soil. Deferred grazing, cross fencing, and stock water facilities help prevent range deterioration and promote the growth of desirable plant species.

This soil provides a habitat best suited to rangeland wildlife, such as antelope, cottontail, coyote, and jackrabbit. Forage production is often low, and livestock grazing needs careful management if wildlife and livestock share the range. Livestock watering facilities are used by a variety of wildlife.

The primary soil limitations for urban development are the low bearing strength of Lamanga soil and very rapid

permeability of the substratum in the Dunul soil. Septic tank filter fields or sewage lagoons can pollute ground water. Caving is a hazard when these soils are excavated. The capability subclasses are IVs irrigated and VIIs nonirrigated.

16—Empedrado-Curecanti complex, 5 to 25 percent slopes. These soils occur on foothills and old alluvial fans at elevations of 8,000 to 9,200 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 40 degrees F, and the frost-free season lasts about 80 to 90 days. The Empedrado soil makes up about 40 percent of the map unit, the Curecanti soil about 30 percent, rock outcrop about 25 percent, and minor soils about 5 percent.

The Empedrado soil is a deep, well drained soil formed in alluvium from rhyolite and andesite on upland hills and alluvial fans. Typically, the surface layer is brown loam about 4 inches thick. The subsoil is brown and pinkish gray sandy clay loam about 18 inches thick. The substratum is very pale brown and light yellowish brown loam and sandy loam to a depth of 60 inches.

Permeability is moderate. The available water capacity is high. Runoff is medium, and the erosion hazard is moderate. The effective rooting depth is 60 inches or more.

The Curecanti soil is a deep, well drained, very cobbly soil. It formed in mixed alluvium and occurs on alluvial fans and high terraces. Typically, the surface layer is grayish brown very cobbly loam about 3 inches thick. The subsoil is brown and pale brown very cobbly sandy clay loam about 31 inches thick. The substratum is light brownish gray very cobbly loamy sand that extends to a depth of 60 inches or more.

Permeability is moderate. The available water capacity is low. Runoff is medium, and the erosion hazard is moderate. The effective rooting depth is 60 inches or more.

These soils are used as summer range for livestock and wildlife habitat. Trees are cut for fence posts and firewood in some wooded areas.

The potential native vegetation is dominated by a thin stand of pinyon and juniper with an understory of Indian ricegrass, needleandthread, western wheatgrass, Scribner needlegrass, and smaller amounts of sand dropseed, blue grama, squirreltail, fourwing saltbush, and mountainmahogany. If the range deteriorates, the proportion of Indian ricegrass, needleandthread, and western wheatgrass decreases, and the proportions of blue grama, sand dropseed, threeawn, pricklypear, yucca, forbs, and woody shrubs increase. Undesirable weeds and annual plants invade and become abundant if the range condition becomes poorer.

Seeding on this complex is not advisable because of the cobbly surface and rock outcrops. Deferred grazing and cross fencing are needed to prevent range deterioration and promote the growth and increase of desirable plant species.

These soils provide a habitat best suited to rangeland wildlife, such as antelope, cottontail, and coyote. Deer also use these soils, mainly early in spring and late in fall. Forage production is often low, and livestock grazing needs proper management if wildlife and livestock share the range. Livestock watering facilities are used by a variety of wildlife.

Slopes, seepage, and large stones are soil limitations that must be considered when planning the construction of houses and roads. Special erosion control practices must be provided to minimize runoff and soil erosion. Special site or building designs may be required because of slope. The large stones can be removed by heavy equipment when preparing building sites and roads. The large amounts of coarse fragments in the subsoil of the Curecanti soil and rock outcrop may cause some excavation problems, especially during the installation of underground utility lines. Problems arise with septic tank absorption fields because of the slope and coarse fragments. The esthetic value of the many trees on the complex should be taken into account when planning homesites. The capability subclass is VIIe.

17—Garita cobbly loam, 0 to 3 percent slopes. This is a deep, well drained soil on alluvial fans and terraces at elevations of 7,500 to 8,500 feet. It formed in thick, calcareous, gravelly and cobbly alluvium derived principally from basalt. The average annual precipitation is about 7 inches, the average annual air temperature is about 41 degrees F, and the average frost-free period lasts about 95 days.

Included in this unit are small areas of Travelers gravelly loam, Luhon loam, and basalt bedrock outcrops.

Typically, the surface layer is light brownish gray cobbly loam about 7 inches thick. The underlying material is very pale brown very cobbly loam to a depth of 60 inches.

Permeability is moderate. Available water capacity is moderate. Runoff is slow, and the erosion hazard is slight. Effective rooting depth is 60 inches or more.

This soil is in native range for sheep and cattle. A few small areas are irrigated fields. Commercial fertilizer and manure need to be applied and plant residues used in the irrigated areas.

Irrigation methods suitable for this soil are border irrigation with short lengths of run and sprinklers.

The potential native vegetation is dominated by winterfat, fourwing saltbush, Indian ricegrass, squirreltail, and blue grama. If the range deteriorates, the proportion of these desirable plants decreases, and the proportion of plants such as threeawn, pricklypear, snakeweed, pingue, and other forbs increases. Undesirable weeds and annual plants invade and become abundant if the range condition becomes poorer.

Seeding this soil is not advisable because of the small amount of rainfall. Deferred grazing, cross fencing, and stock water developments are needed to prevent range

deterioration and to promote the growth and increase of desirable plant species.

Wildlife populations are limited on this soil by low vegetative production. Nonirrigated areas are best suited to openland and rangeland wildlife such as jackrabbit, cottontail, and coyote. Creating wildlife habitat on this sparsely vegetated soil requires proper management of the livestock grazing. In irrigated areas, crop residues from oats and barley may be used by ring-necked pheasant, waterfowl, and geese.

The greatest soil limitation for urban development is the amount of coarse fragments in this soil. The large amounts of coarse fragments in the subsoil may cause excavation problems, especially during the installation of underground utility lines. The capability subclasses are IVs irrigated and VIIs nonirrigated.

18—Garita cobbly loam, 3 to 25 percent slopes. This is a deep, well drained soil on alluvial fans and terraces at elevations of 7,500 to 8,500 feet. It formed in thick, calcareous, gravelly and cobbly alluvium derived principally from basalt. The average annual precipitation is about 7 inches, the average annual air temperature is about 41 degrees F, and the average frost-free period lasts about 95 days.

Included in mapping are small areas of Travelers very stony loam, 3 to 25 percent slopes; Luhon loam, 3 to 9 percent slopes; and basalt rock outcrop.

Typically, the surface layer is light brownish gray cobbly loam about 7 inches thick. The underlying material is very pale brown very cobbly loam to a depth of 60 inches.

Permeability is moderate. Available water capacity is moderate. Runoff is moderate, and the erosion hazard is moderate. Effective rooting depth is 60 inches or more.

This soil is used as native range for sheep and cattle. The potential native vegetation is dominated by winterfat, fourwing saltbush, Indian ricegrass, squirreltail, and blue grama. If the range deteriorates, the proportion of these desirable plants decreases, and the proportion of plants such as threeawn, pricklypear, snakeweed, pingue, and other forbs increases. Undesirable weeds and annual plants invade and become abundant if the range condition becomes poorer.

Seeding this soil is not advisable because of the low rainfall. Deferred grazing, cross fencing, and stock water facilities are the practices most needed to prevent range deterioration and to promote the growth and increase of desirable plant species.

Rangeland wildlife, such as antelope, cottontail, coyote, and jackrabbit, are best suited to the habitat on this droughty soil. Forage production is typically low, and livestock grazing needs to be managed properly if wildlife and livestock share the range. Livestock watering facilities are also important and are used by a variety of wildlife.

The greatest soil limitations for urban development are coarse fragments and slope. The large amounts of coarse fragments in the subsoil may cause some excavation problems, especially during the installation of underground utility lines. This soil also requires special site or building designs because of slope. A surface dressing of topsoil is desirable where the very stony substratum is exposed during site preparation. The capability subclass is VIIe nonirrigated.

19—Graypoint gravelly sandy loam, 0 to 1 percent slopes. This is a deep, well drained soil on broad alluvial fans and terraces at elevations of 7,600 to 7,800 feet. It formed in alluvium derived principally from basalt. The average annual precipitation is about 7 inches, the average annual air temperature is about 41 degrees F, and the frost-free season lasts about 95 days.

Included in mapping are small areas of Derrick very cobbly sandy loam, Platoro loam, and San Arcacio sandy loam.

Typically, the surface layer is brown gravelly sandy loam about 5 inches thick. The subsoil is yellowish brown and pale brown, gravelly sandy clay loam about 13 inches thick. The substratum, to a depth of more than 60 inches, is sand or gravel.

Permeability is moderate. Available water capacity is low. Runoff is slow, and the erosion hazard is slight. Effective rooting depth is 60 inches or more.

This soil is used for irrigated crops, irrigated pasture and hayland, and range. Crops are small grains, alfalfa, potatoes, and other vegetables. Commercial fertilizer and manure need to be applied and plant residues returned to the soil. Irrigation methods suitable for this soil are border, furrow, and sprinkler. Sprinkler irrigation is well suited to most crops. The furrow method is suited to row crops. Border irrigation is suited to alfalfa, small grains, and pasture if runs are relatively short. Land leveling may expose gravel in the more shallow areas.

The potential native vegetation is dominated by Indian ricegrass, western wheatgrass, needleandthread, blue grama, winterfat, and fourwing saltbush. If the range deteriorates, the proportions of Indian ricegrass, needleandthread, and western wheatgrass decrease and the amounts of blue grama, squirreltail, threeawn, snakeweed, and rabbitbrush increase. Undesirable weeds and annual plants invade and become abundant if the range condition becomes poorer.

Seeding is generally not advisable because of low rainfall and low available water capacity. Deferred grazing, cross fencing, and stock water facilities help prevent range deterioration and promote the growth of desirable plant species.

Wildlife on this soil includes openland and rangeland species, such as jackrabbit, cottontail, coyote, and various rodents. Production of vegetation suitable for wildlife habitat is limited when this soil is used as range and is not irrigated. Creating wildlife habitats on this soil requires proper management of livestock grazing. In irrigated areas, crop residues from alfalfa, barley, and oats may be used by pheasant, waterfowl, and geese.

The greatest soil limitation for urban development is excessive seepage due to the gravelly substratum. Caving of cutbanks is a hazard when excavating. Septic tank systems and sanitary landfills may contaminate ground water because of the permeability of the soil. Community sewage system should be provided if the population density increases. The capability subclasses are IVs irrigated and VIIs nonirrigated.

20—Graypoint gravelly sandy loam, 1 to 3 percent slopes. This is a deep, well drained soil on broad alluvial fans and terraces at elevations of 7,600 to 7,800 feet. It formed in alluvium derived principally from basalt. The average annual precipitation is about 7 inches, the average annual air temperature is about 41 degrees F, and the frost-free season lasts about 95 days.

Included in mapping are small areas of Derrick very cobbly sandy loam, Dunul gravelly sandy loam, and Platoro loam. There is an area of Graypoint soil along La Jara Creek southwest of Capulin that is very difficult to farm because of large boulders on the surface. This area is used as range for livestock and as wildlife habitat. Native vegetation is low rabbitbrush, blue grama, threeawn, and sand dropseed.

Typically, the surface layer is brown gravelly sandy loam about 5 inches thick. The subsoil is yellowish brown and pale brown, gravelly sandy clay loam about 13 inches thick. The substratum, to a depth of 60 inches or more, is sand and gravel.

Permeability is moderate. Available water capacity is low. Runoff is slow, and the erosion hazard is slight to moderate. Effective rooting depth is 60 inches or more.

This soil is used for irrigated crops, irrigated pasture and hayland, and rangeland (fig. 7). Crops are small grains, alfalfa, potatoes, and other vegetables. Commercial fertilizer and manure need to be applied and plant residues returned to the soil in irrigated areas. Irrigation methods suitable for this soil are sprinkler, furrow, and border. Sprinkler irrigation is well suited to most crops. The furrow method is used for row crops. The border method, with short length of run, is suited to alfalfa, small grains, and pasture.

The potential native vegetation is dominated by Indian ricegrass, western wheatgrass, needleandthread, blue grama, and fourwing saltbush. If the range deteriorates, the proportions of Indian ricegrass, needleandthread, and western wheatgrass decrease and the amounts of blue grama, squirreltail, threeawn, snakeweed, and rabbitbrush increase. Undesirable weeds and annual plants invade and become abundant if the range condition becomes poorer.

Seeding is generally not advisable because of the low rainfall and low available water capacity. Deferred grazing, cross fencing, and stock water facilities help to prevent range deterioration and promote the growth of desirable plant species.

Wildlife on this soil includes openland and rangeland species such as jackrabbit, cottontail, coyote, and various rodents. Production of vegetation suitable for wildlife habitat is limited when this soil is used as range and not irrigated. Creating wildlife habitat on this soil requires proper management of livestock grazing. In irrigated areas, crop residues from alfalfa, barley, and oats may be used by pheasants, waterfowl, and geese.

The greatest soil limitation for urban development is excessive seepage due to the gravelly substratum. Caving of cutbanks is a hazard when excavating. Septic tank systems and sanitary landfills may contaminate ground water due to the permeability of the soil. Community sewage systems should be provided if the population density increases. The capability subclasses are IVs irrigated and VIIs nonirrigated.

21—Graypoint gravelly sandy loam, wet. This is a deep, wet soil on broad terraces and alluvial fans at elevations of 7,600 to 7,800 feet. It formed in alluvium derived principally from basalt. The average annual precipitation is about 7 inches, the average annual air temperature is about 41 degrees F, and the frost-free season lasts about 95 days. Slopes are 0 to 1 percent.

Included in mapping are small areas of LaJara loam, Quamon gravelly sandy loam, and San Arcacio sandy loam.

Typically, the surface layer is brown gravelly sandy loam about 5 inches thick. The subsoil is yellowish brown and pale brown gravelly sandy clay loam about 13 inches thick. The substratum, to a depth of more than 60 inches, is sand and gravel.

A seasonal high water table is within 1 1/2 to 2 feet of the surface during the growing season because of seepage from irrigation ditches. Permeability is moderate. Available water capacity is low. Runoff is slow, and the erosion hazard is slight. Effective rooting depth is 60 inches or more.

The soil is used primarily for irrigated pasture and hayland and for range. Some areas are irrigated cropland. Crops are barley, oats, and alfalfa. Successful cropping of this soil requires the application of commercial fertilizers and manure, and the return of plant residues. Irrigation methods suitable for this soil are sprinkler and border. Sprinkler irrigation is well suited to most crops. Border irrigation is suited to alfalfa, small grains, and pasture. Where drainage is provided, the water table can be controlled and subirrigation can be used for crop production.

The potential native vegetation is dominated by alkali sacaton, alkali cordgrass, creeping wildrye, wedge grass, bluegrass, sedges, and rushes. Greasewood, rabbitbrush, and cinquefoil are sparse. If the range deteriorates, the proportion of desirable forage species decreases and the proportion of sedges, rushes, foxtail barley, greasewood, and cinquefoil increases. Undesirable weeds and annual plants invade and become abundant if the range condition becomes poorer.

Seeding is generally not advisable because of the poor condition of the soil and high water table, the low

rainfall, and the extreme cost of land preparation. Controlling excess water, renovating, deferring and rotating grazing, cross fencing, and controlling brush will prevent range deterioration and promote the growth of desirable plant species.

Rangeland wildlife including antelope, jackrabbit, cottontail, horned lark, and lark bunting are suited to the grassland habitat that develops on this soil. Proper livestock grazing, fencing which allows for free movement of antelope, and livestock water facilities increase rangeland wildlife populations. Where water is available, shallow water areas can be developed for wetland wildlife.

The greatest limitation to urban development is the high water table. Caving of cutbanks is a hazard when excavating. Septic tanks and sanitary landfills will contaminate ground water because of the high water table and gravelly substratum. Alternate systems for waste disposal such as community sewage systems should be provided. The capability subclasses are IVw irrigated and VIw nonirrigated.

22—Hooper clay loam. This is a deep, well drained saline-alkali soil on old flood plains. It formed in alluvium derived principally from volcanic rock and occurs at elevations of 7,500 to 7,800 feet. The average annual precipitation is about 7 inches, the average annual air temperature is about 41 degrees F, and the frost-free period lasts about 95 days. Slopes are 0 to 1 percent.

Included in mapping are small areas of Hooper loamy sand, Arena soils, and Mosca soils.

Typically, the surface layer is light gray clay loam about 3 inches thick. The subsoil is yellowish brown and very pale brown heavy clay loam about 18 inches thick. The upper part of the substratum is very pale brown and light gray sandy clay loam about 16 inches thick. Sand and gravel is at a depth of 37 inches.

Permeability is very slow above the gravelly substratum. Available water capacity is very low. Runoff is very slow, and the erosion hazard is slight. The soil has a seasonal high water table 4 to 6 feet below the surface. Effective rooting depth is 60 inches or more.

This soil is used primarily as range. The potential native vegetation is dominated by greasewood, rabbitbrush, and inland saltgrass. If the range deteriorates, the proportion of inland saltgrass decreases and the proportion of greasewood and rabbitbrush increases.

Seeding is not advisable because of the low rainfall, very low available water capacity, and strong alkali condition. Deferred grazing, cross fencing, stock water facilities, and brush control help prevent range deterioration and promote growth of desirable plant species.

Wildlife is limited to jackrabbit and coyote because this soil lacks potential to produce the necessary habitat elements for other species. Extreme care is needed to manage livestock grazing if any wildlife is to exist on this soil.

The greatest soil limitations to urban development on this soil are the clayey texture, shrink-swell, excess salt and alkali, and depth to seasonal high water table. Dwelling and road designs can be modified to offset these limiting features. Problems arise with septic tank absorption fields because of slow permeability in the upper 37 inches and the very rapid permeability in the underlying material. Alternate systems for waste disposal, such as community sewage systems, should be provided in areas where ground-water pollution might occur. The capability subclass is VIIs nonirrigated.

23—Hooper loamy sand. This is a deep, well drained saline-alkali soil on old flood plains. It formed in alluvium derived principally from volcanic rock covered by a wind-deposited surface layer. This soil occurs at elevations of 7,500 to 7,800 feet. The average annual precipitation is about 7 inches, the average annual air temperature is about 41 degrees F, and the average frost-free period lasts about 95 days. Slopes are 0 to 1 percent.

Included in this unit are small areas of Hooper clay loam, Mosca soils, and Arena soils.

Typically, the surface layer is light brownish gray loamy sand about 6 inches thick. The subsurface layer is light gray sandy clay loam about 2 inches thick. The subsoil is yellowish brown and very pale brown heavy clay loam about 18 inches thick. The upper part of the substratum is very pale brown and light gray sandy clay loam about 16 inches thick. It overlies sand and gravel at a depth of 37 inches.

Permeability is very slow. Available water capacity is very low. Runoff is slow, and the erosion hazard is low; however, the hazard of soil blowing is moderate. A seasonal high water table is 4 to 6 feet below the surface. Effective rooting depth is 60 inches or more.

The soil is used mainly as range and for wildlife habitat. Small areas occur in irrigated fields consisting mostly of other soils.

The potential native vegetation is dominated by alkali sacaton, greasewood, rabbitbrush, and inland saltgrass. If the range deteriorates, the proportion of desirable grasses such as alkali sacaton decreases and the proportion of greasewood, rabbitbrush, and inland saltgrass increases. Undesirable weeds and annual plants invade and become abundant if the range condition becomes poorer.

Seeding is not advisable, because of the low rainfall, very low available water capacity, and saline-alkali condition of the soil. Deferred grazing, cross fencing, stock water facilities, and brush control help prevent range deterioration and promote growth of desirable plant species.

Openland and rangeland wildlife such as jackrabbit, cottontail, and coyote are best suited to the habitat on this soil. Populations are limited by low vegetative production. Creating wildlife habitat on these sparsely vegetated soils requires proper management of livestock grazing. In irrigated areas, crop residues from oats and barley may be used by ring-necked pheasant, waterfowl, and geese.

The greatest limitations to urban development are the clayey subsoil, shrink-swell hazard, very slow permeability, and excess salt and alkali condition of the soil. Dwelling and road designs can be modified to offset these limitations. Problems arise with septic tank absorption fields because of the very slow permeability of the soil. Alternate methods of waste disposal, such as community sewage systems, should be provided in areas where ground water pollution might occur. The capability subclasses are VIs irrigated and VIIs nonirrigated.

24—Jerry loam, 3 to 25 percent slopes. This is a deep, well drained soil on mountainsides and valley-filling side slopes at elevations of 8,500 to nearly 10,000 feet. It formed in cobbly alluvium derived mainly from rhyolite, andesite, and similar rocks. The average annual precipitation is about 20 inches, the average annual air temperature is about 37 degrees F, and the average frost-free period lasts about 70 days. Slopes are 3 to 25 percent.

Included in mapping are small areas along drainageways that are mottled from wetness. Also, there are small areas of Bushvalley very stony loam and a few rock outcrops.

Typically, the surface layer is dark grayish brown loam about 12 inches thick. The subsoil is yellowish brown and light brown heavy clay loam or cobbly clay loam about 22 inches thick. The substratum is light brown cobbly clay to a depth of 60 inches.

Permeability is slow. Available water capacity is high. Runoff is rapid, and the erosion hazard is moderate. Effective rooting depth is 60 inches or more.

This soil is used as native range. It is grazed by cattle in summer and by deer and elk in fall and early in spring.

The potential native vegetation is dominated by Thurber fescue, wheatgrasses, and big bluegrass. Small amounts of fringed sagebrush, snowberry, and cinquefoil are also present. If the range deteriorates, the proportion of Thurber fescue and wheatgrasses decrease and the proportion of lower value grasses, forbs, and woody shrubs increases. Undesirable weeds and annual plants invade and become abundant if the range condition becomes poorer.

Seeding is advisable if the range has been depleted. Species suitable for seeding are pubescent wheatgrass, intermediate wheatgrass, smooth brome, and big bluegrass. Plowing and drilling should be done on the contour or across the slope to minimize runoff and soil loss before the grasses become established. Seeding could also be done in conjunction with range pitting. Midsummer (late June) seedings have proven most successful. Deferred grazing, cross fencing, and stock water facilities are generally needed to prevent range deterioration and to promote the growth of desirable plant species.

Deer, elk, coyote, cottontail, horned lark, and lark bunting are suited to the grassland habitat that develops on this soil. Proper livestock grazing, fencing which allows free movement of deer and elk, and livestock water facilities increase wildlife populations.

The greatest limitations to urban development are shrink-swell potential, frost action hazard, and slope. The soil permeability is a limiting factor for septic tank absorption fields, and alternate methods of sewage disposal are necessary to prevent pollution. The capability subclass is VIe.

25—LaJara loam. This is a deep, poorly drained soil on flood plains and low terraces at elevations of 7,600 to 7,800 feet. It formed in mixed alluvium derived mainly from igneous rock. The average annual precipitation is about 7 inches, the average annual air temperature is about 41 degrees F, and the frost-free period lasts about 95 days. Slopes are 0 to 1 percent.

Included in mapping are small areas of Alamosa, La-Sauses, and Vastine soils.

Typically, the surface layer is grayish brown and gray loam and sandy loam about 8 inches thick. The subsoil is light brownish gray mottled sandy loam about 13 inches thick. The substratum is variegated gray to brown thinly stratified sandy loam, loamy sand, and sand to a depth of 60 inches or more.

Permeability is moderately rapid. Available water capacity is moderate. Runoff is very slow, and the erosion hazard is slight. Effective rooting depth is 60 inches or more. A seasonal high water table is within 1 foot of the surface in spring and early in summer most years. This soil is subject to frequent flooding during the spring runoff period.

This soil is used for native range and meadow hay and for irrigated alfalfa and small grains where drainage has been established. The border method of irrigation is well suited to pasture, hay, and small grains. Land leveling and both surface and subsurface drainage are necessary to prevent waterlogging of the soil and damage to crops.

The potential native vegetation is dominated by alkali sacaton and wheatgrasses. If the range deteriorates, the proportion of desirable forage species decreases and the proportion of sedges, rushes, greasewood, and cinquefoil increases. Undesirable weeds and annual plants invade and become abundant if the range condition becomes poorer.

Seeding is generally not advisable because of wetness and the high cost of land preparation. Control of excess water, renovating, deferred and rotation grazing, cross fencing, and brush control prevent range deterioration and promote the growth and increase of desirable plant species.

Wet areas of this soil are well suited to shallow water developments which use open water areas created by excavation or pothole blasting. Developments such as these would increase waterfowl and shorebird populations. Because of the availability of moisture, this soil provides excellent waterfowl nesting cover if livestock grazing is carefully managed.

The greatest soil limitations to urban development are the flooding hazard, high water table, and frost action hazard. Dikes or levees are needed to protect against flooding, and drainage systems are needed to lower the ground water in preparation for any type of construction. Community-type sewage systems are necessary to prevent the pollution of ground water. The capability subclasses are IVw irrigated and Vw nonirrigated.

26—Lamanga sandy clay loam. This is a deep, somewhat poorly drained soil on low alluvial terraces and flood plains at elevations of 7,600 to 7,800 feet. It formed in mixed alluvium derived mainly from igneous rock. The average annual precipitation is about 7 inches, the average annual temperature is about 41 degrees F, and the frost-free period lasts about 95 days. Slopes are 0 to 1 percent.

Included in mapping are small areas of Dunul, LaJara, and Mogote soils.

Typically, the surface layer is brown sandy clay loam about 6 inches thick. The subsoil is brown and light brownish gray clay loam about 13 inches thick. The substratum is brown gravelly sandy loam to a depth of 60 inches or more.

Permeability is moderately slow. Available water capacity is high. Runoff is slow, and the erosion hazard is slight. A seasonal high water table is 1 1/2 to 3 feet below the surface during the growing season. Effective rooting depth is about 60 inches or more.

This soil is used for range, irrigated pasture and hay, and irrigated alfalfa and small grains. Applications of commercial fertilizers and manure are commonly needed, and plant residues should be returned to the soil. Generally all crops except legumes respond to applications of nitrogen and phosphorus fertilizer; legumes respond to phosphorus fertilizer.

This soil is suited to border and furrow irrigation methods. Drainage is needed to prevent waterlogging and crop damage. Land leveling is necessary to obtain proper water distribution and help prevent salt accumulation.

The potential native vegetation is dominated by alkali sacaton and wheatgrasses. Creeping wildrye, sedges, and rushes are sparse. If the range deteriorates, the proportion of desirable forage species decreases and the proportion of sedges, rushes, greasewood, and cinquefoil increases. Undesirable weeds and annual plants invade and become abundant if the range condition becomes poorer.

Seeding is generally not advisable because of the soil wetness, low rainfall, and the high cost of land preparation. Control of excess water, renovating, deferred and rotation grazing, cross fencing, and brush control prevent range deterioration and promote the growth of desirable plant species.

Populations of wetland wildlife, including ducks and shorebirds, can be increased by development of shallow water areas created by pothole blasting or excavation. Good wildlife management on this soil also includes prevention of overgrazing by livestock, fire protection, and prevention of drainage. Where livestock are present, wildlife developments should be fenced to prevent encroachment and use by livestock.

Major soil limitations for urban development are the high water table, frost action hazard, and relatively low strength. Drains are needed to lower the ground water, along with structural designs that compensate for the limited load-bearing capacity of the soil. The capability subclasses are IIIw irrigated and VIw nonirrigated.

27—LaSauses sandy clay loam. This is a deep, poorly drained saline-alkali soil on alluvial flood plains at elevations of 7,600 to 7,800 feet. It formed in mixed alluvium, derived mainly from igneous rock. The average annual precipitation is about 7 inches, the average annual air temperature is about 41 degrees F, and the frost-free period lasts about 96 days. Slopes are 0 to 1 percent.

Included in mapping are small areas of LaJara and Lamanga soils.

Typically, the surface layer is brownish yellow sandy clay loam and clay loam about 16 inches thick. The subsoil is very pale brown heavy clay loam about 14 inches thick. The upper part of the substratum is brownish yellow stratified heavy clay loam and sandy clay loam about 22 inches thick. The lower part is sand and gravel that extends to a depth of 60 inches.

Permeability is very slow. Available water capacity is moderate. Runoff is slow, and the erosion hazard is slight. A seasonal high water table is within 1/2 to 2 feet of the surface in spring and early in summer most years. Effective rooting depth is 60 inches or more.

This soil is used as native range, irrigated pasture, and hayland. A few small areas are used for irrigated alfalfa and small grains. The soil needs to be drained and leached of salts for crop production. Drainage outlets may be difficult to locate. Leaching salts from the root zone is difficult because of the very slow water movement through the soil.

The border method of irrigation is most suitable for pasture and crops. Land leveling is needed to obtain adequate distribution of irrigation water. Deep subsoiling helps leach salts and drain the soil.

The potential native vegetation is dominated by alkali sacaton. Greasewood, rabbitbrush, and inland saltgrass are prominent but widely spaced. If the range deteriorates, the proportion of the more desirable grasses, such as alkali sacaton decreases and the proportion of greasewood, rabbitbrush, and inland saltgrass increases. Undesirable weeds and annual plants invade and become abundant if the range condition becomes poorer.

Seeding is not advisable, because the soil contains excess salts, unless irrigation is available for seedling development. Deferred grazing, cross fencing, stock water development, and brush control help prevent

range deterioration and promote growth of desirable plant species.

Rangeland wildlife including antelope, jackrabbit, cottontail, horned lark, and lark bunting are suited to the grassland habitat that develops on this soil. Proper livestock grazing, fencing which allows for free movement of antelope, and livestock water facilities increase wildlife populations.

The major soil limitations for urban development include the high water table, very slow permeability, shrink-swell potential, and frost action hazard. The soil needs to be drained and structures specially designed for building on this soil. Community-type sewage disposal systems are needed to prevent pollution of ground water. The capability subclasses are IVw irrigated and VIw nonirrigated.

28—Luhon loam, 1 to 3 percent slopes. This is a deep, well drained soil on alluvial fans and terraces at elevations of 7,600 to 8,000 feet. It formed in mixed calcareous alluvium. The average annual precipitation is about 10 inches, average annual air temperature is about 41 degrees F, and the average frost-free period lasts about 95 days.

Included in mapping are small areas of McGinty sandy loam, fan; Monte loam; and Garita cobbly loam.

Typically, the surface layer is pinkish gray loam about 8 inches thick. The underlying material is light yellowish brown and pink gravelly loam and loam, to a depth of 60 inches or more.

Permeability is moderate. Available water capacity is moderate. Runoff is medium, and the erosion hazard is moderate. Effective rooting depth is 60 inches or more.

This soil is used for native range and for irrigated pasture and hayland.

This soil is suited to sprinkler and border irrigation methods. Land leveling and relatively short runs are necessary to conserve water and prevent erosion. Drop structures should be installed in irrigation ditches to control water and prevent excessive ditch erosion.

The potential native vegetation is dominated by winterfat, fourwing saltbush, Indian ricegrass, and blue grama. If the range deteriorates, the proportion of these desirable plants decreases and the proportion of plants such as threeawn, pricklypear, snakeweed, and other forbs increases. Undesirable weeds and annual plants invade and become abundant if the range condition becomes poorer.

Seeding is difficult on this soil because of the low rainfall. Deferred grazing, cross fencing, and stock water facilities are needed to prevent range deterioration and to promote the growth of desirable plant species.

Rangeland wildlife, such as antelope, cottontail, coyote, and jackrabbits are best suited to the habitat on this soil. Forage production is typically low, and livestock grazing needs to be managed properly if wildlife and livestock share the range. Livestock watering facilities are used by various wildlife species.

Where this soil is irrigated, openland wildlife can be encouraged if the proper food and cover are provided.

The major soil limitation for urban development is the relatively low strength. This can be overcome by specially designed structures and suitable compaction methods. The capability subclasses are IIIe irrigated and VIe nonirrigated.

29—Luhon loam, 3 to 9 percent slopes. This is a deep, well drained soil on moderately sloping alluvial fans, at elevations of 7,800 to 8,000 feet. It formed in mixed calcareous alluvial sediment. The average annual precipitation is about 10 inches, the average annual air temperature is about 41 degrees F, and the frost-free period lasts about 95 days.

Included in mapping are small areas of McGinty sandy loam, fan; Garita cobbly loam; and Stunner loam.

Typically, the surface layer is pinkish gray loam about 8 inches thick. The underlying material is light yellowish brown and pink loam to a depth of 60 inches or more.

Permeability is moderate. Available water capacity is moderate. Runoff is medium, and the erosion hazard is moderate. The soil is used for range and wildlife habitat. Effective rooting depth is 60 inches or more.

The potential native vegetation is dominated by winterfat, fourwing saltbush, Indian ricegrass, and blue grama. If the range deteriorates, the proportion of these desirable plants decreases and the proportion of plants such as threeawn, pricklypear, snakeweed, and other forbs increases. Undesirable weeds and annual plants invade and become abundant if the range condition becomes poorer.

Seeding is difficult on this soil because of the low rainfall. Deferred grazing, cross fencing, and stock water developments are needed to prevent range deterioration and to promote the growth of desirable plant species.

Rangeland wildlife, such as antelope, cottontail, coyote, and jackrabbit are best suited to the habitat on this soil. Forage production is typically low, and livestock grazing needs to be managed properly if wildlife and livestock share the range. Livestock watering facilities are used by a variety of wildlife.

The major soil limitation for urban development is its relatively low strength. Specially designed structures and roads can offset the soil's limited ability to support a load. Slopes are a limitation for sewage disposal systems and sanitary landfills. Vegetative cover should be disturbed as little as possible during any construction to minimize soil loss. The capability subclass is VIIe nonirrigated.

30—McGinty sandy loam. This is a deep, moderately well drained soil on flood plains and fans at elevations of 7,600 to 7,800 feet. It formed in alluvium mainly from basalt and similar igneous rock. The average annual precipitation is about 7 inches, the mean annual air temperature is about 41 degrees F, and the frost-free period lasts about 95 days. Slopes are 0 to 1 percent.

Included in mapping are small areas of Mosca loamy sand and Zinzer loam.

Typically, the surface layer is brown and light gray sandy loam about 15 inches thick. The underlying material is light gray and light brownish gray sandy loam to a depth of 60 inches or more.

Permeability is moderately rapid. Available water capacity is moderate. Runoff is slow, and the erosion hazard is slight. The soil blowing hazard is moderate. A seasonal high water table rises to within 4 feet of the surface during the irrigation season. Effective rooting depth is 60 inches or more.

This soil is used for range and for irrigated potatoes, barley, oats, and alfalfa. Applications of commercial fertilizers and manure are needed, and plant residues should be returned to the soil. Generally all nonlegume crops respond to nitrogen and phosphate fertilizer; legumes respond to phosphate fertilizer.

This soil is suitable for sprinkler, border, or furrow irrigation methods. Sprinkler irrigation is well suited to most crops. The furrow method is suited to row crops, and border irrigation is suited to alfalfa, small grains, and pasture. Land leveling and relatively short runs are needed to conserve water and prevent seepage and salt buildup in the soil.

The potential native vegetation is dominated by alkali sacaton and inland saltgrass. Common shrubs are fourwing saltbush, greasewood, and tall rabbitbrush. If the range deteriorates, the proportion of alkali sacaton decreases and the amounts of inland saltgrass, forbs, and woody shrubs increase. Greasewood and tall rabbitbrush increase and annual weeds invade and become abundant if the range condition becomes poorer.

Seeding on this soil is not advisable because of low rainfall. Deferred grazing, cross fencing, stock water facilities, and brush control are generally needed to prevent range deterioration and to promote the growth of desirable plant species.

Rangeland wildlife, such as antelope, cottontail, coyote, and jackrabbit, are best suited to the habitat on this droughty soil. Forage production is typically low, and livestock grazing needs to be managed properly if wildlife and livestock share the range. Livestock watering facilities are also important and are used by a variety of wildlife.

Where this soil is irrigated, openland wildlife can be encouraged if food and cover is provided.

Major soil limitations for urban development are the moderate frost action potential, moderately rapid permeability, and the seasonal water table.

Designs of roads and structures need to be modified to offset the frost hazard. Community sewage systems are necessary to prevent ground water pollution. The capability subclasses are IIIs irrigated and VIIs nonirrigated.

31—McGinty sandy loam, fan, 1 to 3 percent slopes. This is a deep, well drained soil on alluvial fans at elevations of 7,600 to 7,800 feet. It formed in alluvium derived from basalt and similar igneous rock. The average annual precipitation is about 7 inches, mean annual air temperature is about 41 degrees F, and the frost-free season lasts about 95 days. Slopes are 1 to 3 percent.

Included in mapping are small areas of Garita cobbly loam and Luhon loam.

Typically, the surface layer is brown and light gray sandy loam about 15 inches thick. The underlying material is light gray sandy loam and light brownish gray gravelly sandy loam to a depth of 60 inches.

Permeability is moderately rapid. Available water capacity is moderate. Runoff is slow, and the erosion hazard is slight. The wind erosion hazard is moderate. Effective rooting depth is 60 inches or more.

This soil is used for native range, irrigated crops, and irrigated hay. Crops best suited to this soil are barley, oats, and alfalfa. Commercial fertilizers and manure are needed and plant residues should be returned to the soil. Generally nonlegumes respond to nitrogen and phosphate fertilizers; legumes respond to phosphate fertilizers.

This soil is suitable for sprinkler and border irrigation methods. Land leveling and narrow borders, as well as short runs, conserve water and help prevent erosion.

The potential native vegetation is dominated by Indian ricegrass, sand dropseed, western wheatgrass, blue grama, winterfat, and fourwing saltbush. If the range deteriorates, the proportion of Indian ricegrass and western wheatgrass decreases and the proportion of sand dropseed, threeawn, pricklypear, forbs, and woody shrubs increases. Undesirable weeds and annual plants invade and become abundant if the range condition becomes poorer.

Seeding on this soil is not advisable because of the low rainfall. Deferred grazing, cross fencing, stock water facilities, and brush control generally prevent range deterioration and promote the growth of desirable plant species.

Rangeland wildlife, such as antelope, cottontail, coyote, and jackrabbit, are best suited to the habitat on this droughty soil. Forage production is typically low, and livestock grazing needs to be managed properly if wildlife and livestock share the range. Livestock watering facilities are used by a variety of wildlife.

Where this soil is irrigated, openland wildlife can be encouraged if food and cover are provided.

A limitation for urban development is the moderately rapid permeability of the soil, which causes ground water pollution if sewage and solid waste disposal systems are not properly designed. The capability subclasses are IIIe irrigated and VIIe nonirrigated.

32—McGinty sandy loam, fan, 3 to 9 percent slopes. This is a deep, well drained soil on alluvial fans at elevations of 7,600 to 7,800 feet. It formed in alluvium derived mainly from basalt and similar igneous rock. The average annual precipitation is about 7 inches, the mean

annual air temperature is about 41 degrees F, and the frost-free season lasts about 95 days.

Included in mapping are small areas of Garita cobbly loam and Luhon loam.

Typically, the surface layer is brown and light gray sandy loam about 15 inches thick. The underlying material is light gray and light brownish gray sandy loam and gravelly sandy loam to a depth of 60 inches.

Permeability is moderately rapid. Available water capacity is moderate. Runoff is medium, and water and wind erosion hazards are moderate. Effective rooting depth is 60 inches or more.

This soil provides native range for sheep and cattle. The potential native vegetation is dominated by Indian ricegrass, sand dropseed, western wheatgrass, blue grama, winterfat, and fourwing saltbush. If the range deteriorates, the proportion of Indian ricegrass and western wheatgrass decreases and the proportion of sand dropseed, threeawn, pricklypear, forbs, and woody shrubs increases. Undesirable weeds and annual plants invade and become abundant if the range condition becomes poorer.

Seeding on this site is not advisable because of the low rainfall. Deferred grazing, cross fencing, stock water developments, and brush control are generally needed to prevent range deterioration and promote the growth of desirable plant species.

Rangeland wildlife such as antelope, cottontail, coyote, and jackrabbit are best suited to the habitat on this soil. Forage production is often low, and livestock grazing needs to be managed properly if wildlife and livestock share the range. Livestock watering facilities are used by a variety of wildlife.

Soil limitations for urban development are moderately rapid permeability and slope. These factors mainly influence the type of sewage disposal system needed to prevent pollution of ground water. The capability subclass is VIIe nonirrigated.

33—Miracle loam, 3 to 9 percent slopes. This is a moderately deep, well drained soil on ridges and mesas in foothill areas at elevations of 8,400 to 9,000 feet. It formed in outwash material derived mainly from igneous rock and the underlying Santa Fe Formation. The average annual precipitation is about 13 inches, mean annual air temperature is about 39 degrees F, and the frost-free period lasts about 80 days.

Included in mapping are small areas of Cumbres very stony loam, Curecanti very cobbly loam, and Empedrado loam.

Typically, the surface layer is dark brown loam about 7 inches thick. The subsoil is dark brown and reddish brown sandy clay loam about 15 inches thick over conglomerate.

Permeability is moderate. Available water capacity is low. Runoff is medium to rapid, and the erosion hazard is moderate. Effective rooting depth is 20 to 40 inches.

This soil is used as native range for sheep and cattle. Pinyon pine and juniper make up about 10 percent of the plant cover in most areas, and the understory vegetation is grass and shrubs.

The potential native vegetation is dominated by pinyon and juniper. The understory is mainly Arizona fescue, needleandthread, western wheatgrass, and Scribner needlegrass with smaller amounts of sand dropseed, blue grama, squirreltail, fourwing saltbush, and mountain-mahogany. If the range deteriorates, the proportion of Arizona fescue, needleandthread grass, and western wheatgrass decreases and the proportion of blue grama, sand dropseed, threeawn, pricklypear, yucca, forbs, and woody shrubs increases. Undesirable weeds and annual plants invade and become abundant if the range condition becomes poorer.

Seeding is advisable if the range is deteriorated. Wheatgrasses usually do well. Deferred grazing and cross fencing are generally needed to prevent range deterioration and to promote the growth of desirable plant species.

Rangeland wildlife such as antelope, cottontail, coyote, and deer are best suited to the habitat on this soil. Forage production is typically low, and livestock grazing needs to be managed properly if wildlife and livestock share the range. Livestock watering facilities are also important and are used by a variety of wildlife.

The major soil limitations for urban development are depth to bedrock, potential frost action hazard, and slope. Designs for roads and structures need to be modified to offset the frost hazard. Sewage and solid waste disposal systems require special designs to prevent pollution of streams and ground water. The capability subclass is VIe.

34—Mishak loam. This is a deep, somewhat poorly drained saline soil on flood plains and low terraces at elevations of 7,600 to 7,800 feet. It formed in calcareous alluvium derived from mixed sources. The average annual precipitation is about 8 inches, the average annual air temperature is about 41 degrees F, and the frost-free period lasts about 95 days. Slopes are 0 to 1 percent.

Included in mapping are small areas of San Arcacio sandy loam, saline, and Zinzer loam, saline.

Typically, the surface layer is pale brown and light yellowish brown, salt-affected loam about 16 inches thick. The underlying material is light gray and light yellowish brown loam and sandy loam to a depth of 60 inches.

Permeability is moderate. Available water capacity is moderate. Runoff is slow, and the erosion hazard is slight. A seasonal high water table is 1 to 2 feet from the surface during the summer months. Effective rooting depth is 60 inches or more.

This soil is used as native range. Drainage and leaching to remove salts from the root zone is necessary for

establishment of all but salt-tolerant plants. Drainage outlets may be hard to find.

The potential native vegetation is dominated by alkali sacaton, alkali cordgrass, western wheatgrass, and creeping wildrye. Greasewood, rabbitbrush, and cinquefoil are sparse. If the range deteriorates, the proportion of desirable forage species decreases and the proportion of sedges, rushes, greasewood, and cinquefoil increases. Undesirable weeds and annual plants invade and become abundant if the range condition becomes poorer.

Seeding is generally not advisable because of the wetness, high salt content, and the high cost of land preparation. Control of excess water, renovating, deferred and rotation grazing, cross fencing, and brush control prevent range deterioration and promote the growth of desirable plant species.

Rangeland wildlife including antelope, jackrabbit, cottontail, horned lark, and lark bunting are suited to the grassland habitat that develops on this soil. Proper livestock grazing, fencing which allows for free movement of antelope, and livestock water facilities increase rangeland wildlife populations. Where water is available, shallow water areas can be developed for wetland wildlife.

Wetness, salts, high frost action hazard, and low strength are the most limiting factors for urban development. Soil drainage and design modifications for roads and structures are necessary for building on this soil. Septic tank systems and trench-type sanitary landfills are not suited to this soil due to the high water table. The capability subclasses are IVw irrigated and VIw nonirrigated.

35—Mishak loam, drained. This is a deep soil on flood plains and low terraces at elevations of 7,600 to 7,800 feet. It has been drained and contains some salt in the surface layer. It formed in calcareous alluvium derived from mixed sources. The average annual precipitation is about 8 inches, the average annual air temperature is about 41 degrees F, and the frost-free period lasts about 95 days. Slopes are 0 to 1 percent.

Included in mapping are small areas of San Arcacio sandy loam and Zinzer loam.

Typically, the surface layer is pale brown and light yellowish brown loam about 16 inches thick. The underlying material is light gray and light yellowish brown loam and sandy loam to a depth of 60 inches.

Permeability is moderate. Available water capacity is moderate. Runoff is slow, and the erosion hazard is slight. A water table occurs about 3 to 4 1/2 feet from the surface during the irrigation season. Effective rooting depth is about 60 inches or more.

This soil is used for irrigated pasture, alfalfa, small grains, and range. Land leveling, leaching of salts, using commercial fertilizer and manure, and returning plant residues to the soil are necessary for good crop production. Drainage systems must be maintained and irrigation water properly managed to prevent soil waterlogging and salt buildup in the root zone.

The border method of irrigation is suitable for this soil. Width of borders and length of runs can be adjusted to help prevent water loss, soil waterlogging, and salt buildup.

The potential native vegetation is dominated by alkali sacaton, alkali cordgrass, and western wheatgrass. Greasewood, rabbitbrush, and cinquefoil are sparse. If the range deteriorates, the proportion of desirable forage species decreases and the proportion of sedges, rushes, greasewood, and cinquefoil increases. Undesirable weeds and annual plants invade and become abundant if the range condition becomes poorer.

Because this soil is nearly all irrigated or has been irrigated in the past, seeding to pasture grasses rather than to native grasses is best. Control of excess water, renovating, deferred and rotation grazing, cross fencing, and brush control will prevent range deterioration and promote the growth of desirable plant species.

Rangeland wildlife including antelope, jackrabbit, cottontail, horned lark, and lark bunting are suited to the grassland habitat that develops on this soil. Proper livestock grazing, fencing which allows for free movement of antelope, and livestock water developments will increase rangeland wildlife populations. Where water is available, shallow water areas can be developed for wetland wildlife species.

The greatest soil limitations for urban development are low bearing strength, seasonal water table, and frost action potential. Designs of roads and structures need to be modified to compensate for the limited ability of the soil to support a load. Soil drainage will lower the water table and help prevent frost damage. Community-type sewage systems should be used to prevent ground water pollution. The capability subclasses are IIIw irrigated and VIw nonirrigated.

36—Mogote loam. This is a deep, somewhat poorly drained soil on alluvial flood plains and low terraces at elevations of 7,600 to 7,800 feet. It formed in mixed alluvium with some influence from basalt rock. The average annual precipitation is about 8 inches, the average annual air temperature is about 41 degrees F, and the frost-free period lasts about 95 days. Slopes are 0 to 1 percent.

Included in this unit are small areas of LaJara loam, Lamanga sandy clay loam, and Quamon gravelly sandy loam.

Typically, the surface layer is brown loam about 8 inches thick. The underlying material is pale brown, light brown, pinkish gray, and yellowish red loam about 37 inches thick over sand and gravel which extends to a depth of more than 60 inches. Mottles are common in the underlying material.

Permeability is moderate. Available water capacity is moderate. Runoff is slow, and the hazard of erosion is slight. A seasonal water table is 2 to 3 1/2 feet below

the surface during the irrigation season. Effective rooting depth is 60 inches or more.

This soil is used for native range, irrigated pasture, alfalfa, and small grains. Land leveling and soil drainage are necessary to prevent water loss and waterlogging of the soil.

Applications of commercial fertilizer and manure are commonly needed, and plant residues should be returned to the soil. Small grains and grasses respond to nitrogen fertilizer. Alfalfa and other legumes respond to phosphate fertilizer.

The border method of irrigation is suited to this soil. Sprinklers are well suited to some fields and to all crops. Regardless of the irrigation method used, water must be applied carefully to avoid waterlogging and salt buildup in the soil.

The potential native vegetation is dominated by alkali sacaton. Greasewood, rabbitbrush, and inland saltgrass are prominent but widely spaced. If the range deteriorates, the proportion of the desirable grasses such as alkali sacaton and western wheatgrass decreases and the proportion of greasewood, rabbitbrush, and inland saltgrass increases. Undesirable weeds and annual plants invade and become abundant if the range condition becomes poorer.

Seeding is not advisable because of the low rainfall and excess salts. Deferred grazing, cross fencing, stock water development, and brush control help prevent range deterioration and promote growth of desirable plant species.

Wetland wildlife, including ducks and shorebirds, can be increased by development of shallow water areas created by pothole blasting or excavation. Other wildlife management includes prevention of overgrazing by livestock, fire protection, and prevention of drainage. Where livestock are present, wildlife developments should be fenced to prevent encroachment and overuse by livestock.

The major soil limitations for urban development include the high water table, high frost action potential, and low bearing strength. The soil needs to be drained and the designs for roads and buildings modified to overcome these limitations. Septic tank systems will not function properly in this soil, and alternate types of sewage disposal systems should be used to prevent contamination of ground water. The capability subclasses are IIIw irrigated and VIw nonirrigated.

37—Monte loam, 0 to 1 percent slopes. This is a deep, well drained soil on alluvial fans and flood plains at elevations of 7,600 to 8,600 feet. It formed in mixed calcareous alluvium derived mainly from igneous rock. The average annual precipitation is about 7 inches, the average annual air temperature is about 41 degrees F, and the average frost-free period lasts about 95 days.

Included in mapping are small areas of Luhon and Stunner loams and Garita cobbly loam.

Typically, the surface layer is brown and pale brown loam about 9 inches thick. The underlying material is light yellowish brown loam that extends to a depth of 60 inches.

Permeability is moderate. Available water capacity is high. Runoff is slow, and the erosion hazard is slight. Effective rooting depth is 60 inches or more.

This soil is used for native range and for irrigated alfalfa, barley, and oats. Applications of commercial fertilizers and manure are generally needed, and plant residues should be returned to the soil. Generally small grains respond to applications of nitrogen fertilizers, and alfalfa and other legumes respond to phosphate fertilizers.

The border method of irrigation is well suited to alfalfa and small grains. Land leveling and proper lengths of run help to conserve water and prevent seepage and salt accumulation.

The potential native vegetation is dominated by Indian ricegrass, blue grama, squirreltail, and western wheatgrass. If the range deteriorates, the proportion of Indian ricegrass and western wheatgrass decreases and the amounts of blue grama, squirreltail, threeawn, snakeweed, and rabbitbrush increase. Undesirable weeds and annual plants invade and become abundant if the range condition becomes poorer.

Seeding is not advisable because of the low rainfall. Deferred grazing, cross fencing, and stock water developments help to prevent range deterioration and promote the growth of desirable plant species.

Wildlife populations on rangeland are limited by low vegetative production. Nonirrigated areas produce a habitat best suited to openland and rangeland wildlife such as jackrabbit, cottontail, and coyote. Where wildlife habitats are planned on these sparsely vegetated soils, livestock grazing needs to be managed properly. In irrigated areas, crop residues from oats and barley are used by ring-necked pheasant, waterfowl, and geese.

A limitation affecting urban development is the limited load-bearing capacity. This may necessitate the modification of road and building plans in some areas. The capability subclasses are IIIc irrigated and VIIs nonirrigated.

38—Monte loam, 1 to 3 percent slopes. This is a deep, well drained soil on alluvial fans and flood plains at elevations of 7,600 to 8,600 feet. It formed in mixed, calcareous alluvium derived mainly from igneous rock. The average annual precipitation is about 7 inches, the average annual air temperature is about 41 degrees F, and the frost-free period lasts about 95 days.

Included in mapping are small areas of Luhon and Stunner loams and Garita cobbly loam.

Typically, the surface layer is brown and pale brown loam about 9 inches thick. The underlying material is light yellowish brown loam to a depth of 60 inches.

Permeability is moderate. Available water capacity is high. Runoff is medium, and the erosion hazard is slight

to moderate. Effective rooting depth is 60 inches or more.

This soil is used for native range, irrigated alfalfa, and small grains. Applications of commercial fertilizers and manure are generally needed, and plant residues should be returned to the soil. Generally, small grains respond to nitrogen and phosphate fertilizers and legumes respond to phosphate fertilizers.

Border irrigation is well suited to alfalfa and small grains. Land leveling, narrow border widths, and short lengths of run help to conserve irrigation water and minimize soil loss.

The potential native vegetation on this soil is dominated by blue grama, Indian ricegrass, western wheatgrass, and squirreltail. If the range deteriorates, the proportion of Indian ricegrass and western wheatgrass decreases; and the amount of blue grama, squirreltail, threeawn, snakeweed, and rabbitbrush increases. Undesirable weeds and annual plants invade and become abundant if the range condition becomes poorer.

Seeding is generally not advisable because of the low rainfall. Deferred grazing, cross fencing, and stock water developments help to prevent range deterioration and promote the growth of desirable plant species.

Wildlife populations on rangeland are limited by low vegetative production. Nonirrigated areas are best suited to openland and rangeland wildlife such as jackrabbit, cottontail, and coyote. Where wildlife habitats are planned on these sparsely vegetated soils, livestock grazing needs to be managed carefully. In irrigated areas, crop residues from oats and barley may be used by ring-necked pheasant, waterfowl, and geese.

A limitation for urban development is the limited capacity of the soil to support a load. Designs for buildings and roads need to be modified to compensate for this limitation. Vegetative cover should be disturbed as little as possible during construction to minimize soil loss. The capability subclasses are IIIe irrigated and VIIe nonirrigated.

39—Mosca loamy sand. This is a deep, well drained soil that is moderately alkali. It is on alluvial fans and flood plains at elevations of 7,600 to 7,800 feet and formed in mixed alluvium derived mainly from igneous rock. The average annual precipitation is about 7 inches, the average annual air temperature is about 41 degrees F, and the frost-free period lasts about 95 days. Slopes are 0 to 1 percent.

Included in mapping are small areas of Hooper loamy sand and McGinty sandy loam.

Typically, the surface layer is light brownish gray loamy sand about 3 inches thick. The subsoil is light brown and light yellowish brown alkali sandy loam about 16 inches thick. The substratum is very pale brown sandy loam about 17 inches thick over sand and gravel that extends to a depth of 60 inches or more.

Permeability is moderate. Available water capacity is moderate. Runoff is slow, and the erosion hazard is slight. The hazard of wind erosion is moderate. Effective rooting depth is 60 inches or more.

This soil is used as native range and for irrigated potatoes, alfalfa, and small grains. Applications of gypsum, commercial fertilizers, and manure are generally needed, and crop residue should be returned to the soil. Gypsum helps leach alkali from the soil. Generally, small grains and potatoes respond to applications of nitrogen and phosphate fertilizers and alfalfa responds to phosphate fertilizers.

Furrow irrigation is well suited to potatoes. Border irrigation is suited to alfalfa and small grains. Land leveling and adjusted lengths of run are necessary to conserve water and prevent seepage and buildup of salts in the surface layer.

The potential native vegetation on this soil is dominated by rabbitbrush, greasewood, and blue grama. If the range deteriorates, the proportion of blue grama decreases and the amounts of sand dropseed, inland saltgrass, forbs, and woody shrubs increase. Annual weeds invade and become abundant if the range condition becomes poorer.

Seeding is not advisable because of the low rainfall and the alkali condition of the soil. Deferred grazing, cross fencing, stock water developments, and brush control are generally needed to prevent range deterioration and to promote the growth of desirable plant species.

Wildlife populations on rangeland are limited by low vegetative production. Nonirrigated areas are best suited to openland and range wildlife such as jackrabbit, cottontail, and coyote. Where wildlife habitats are planned on these sparsely vegetated soils, livestock grazing needs to be managed properly. In irrigated areas, crop residues from oats and barley may be used by ring-necked pheasant, waterfowl, and geese.

The loamy sand surface and frost action hazard are major soil limitations for urban development. Designs of roads and buildings generally need modification when building on this soil. Wind erosion is a hazard whenever vegetation is disturbed. Septic tank systems and trench-type sanitary landfills may contaminate ground water. The capability subclasses are IIIs irrigated and VIIs nonirrigated.

40—Mosca loamy sand, saline. This is a deep, saline-alkali soil on alluvial fans and flood plains at elevations of 7,600 to 7,800 feet. The soil formed in mixed alluvium derived from igneous rock. The average annual precipitation is about 7 inches, the average annual air temperature is about 41 degrees F, and the frost-free period lasts about 95 days. A seasonal high water table is 2 to 3 feet below the surface during the irrigation season because of excessive irrigation and seepage from irrigation ditches. Slopes are 0 to 1 percent.

Included in mapping are small areas of Hooper loamy sand and McGinty sandy loam.

Typically, the surface layer is light brownish gray loamy sand about 3 inches thick. The subsoil is light brown and

light yellowish brown alkali sandy loam about 16 inches thick. The substratum is very pale brown sandy loam about 17 inches thick over sand and gravel that extends to a depth of 60 inches.

Permeability is moderate. Available water capacity is moderately low, runoff is slow, and the erosion hazard is slight. The hazard of soil blowing is moderate. Effective rooting depth is about 60 inches or more.

This soil is used for native range and irrigated pasture. Salt-tolerant plants are best suited to this soil. Land leveling, soil drainage, and leaching salts from the rooting zone of plants are needed for irrigated crop production on this soil.

Drainage outlets may be difficult to find. The application of soil amendments, such as sulfuric acid or gypsum, will help leach alkali salts from the soil if drainage is provided.

Furrow irrigation is well suited to row crops. Border irrigation is suited to alfalfa, small grains, and pasture. Regardless of the irrigation method used, proper lengths of run and good timing are needed to keep water loss to a minimum and help prevent additional salt accumulation in the soil.

The potential native vegetation on this soil is dominated by alkali sacaton. Greasewood, rabbitbrush, and inland saltgrass are prominent but widely spaced. If the range deteriorates, the proportion of alkali sacáton decreases and the proportion of greasewood, rabbitbrush, and inland saltgrass increases. Undesirable weeds and annual plants invade and become abundant if the range condition becomes poorer.

Seeding is not advisable because of the low rainfall and the salt and alkali condition of the soil. Irrigation is necessary for seedling development. Deferred grazing, cross fencing, stock water development, and brush control help prevent range deterioration and promote the growth of desirable plant species.

Wildlife populations on rangeland are limited by low vegetative production. Nonirrigated areas are best suited to openland and rangeland wildlife such as jackrabbit, cottontail, and coyote. Where wildlife habitats are planned on these sparsely vegetated soils, livestock grazing needs to be managed carefully. In irrigated areas, crop residues from oats and barley may be used by ring-necked pheasant, waterfowl, and geese.

Soil limitations for urban development include the high water table and high frost action potential. The soil needs to be drained and designs of roads and buildings modified when building on this soil. Septic tank systems will not function properly because of the high water table. The capability subclasses are IIIw irrigated and VIIw nonirrigated.

41—Nortonville loam. This is a deep, poorly drained saline-alkali soil on alluvial flood plains and low terraces at elevations of 7,600 to 7,800 feet. It formed in mixed alluvium derived primarily from igneous rock. The average annual precipitation is about 7 inches, the average annual air temperature is about 41 degrees F, and the frost-free period lasts about 95 days. Slopes are 0 to 1 percent.

Included in mapping are small areas of Alamosa loam, LaSauses clay loam, and Vastine loam.

Typically, the surface layer is grayish brown loam about 12 inches thick. The underlying material is grayish brown loam and light yellowish brown fine sandy loam and gravelly sandy loam to a depth of 60 inches. A thin salt crust on the surface is common. A high water table is within 1 to 2 1/2 feet of the surface during the irrigation season. This soil is subject to occasional flooding during the spring runoff period.

Permeability is moderately slow. Available water capacity is high. Runoff is slow, and the erosion hazard is slight. Effective rooting depth is 60 inches or more.

This soil is almost entirely irrigated native pasture and rangeland. A few areas have been drained and leveled. Irrigated small grains and alfalfa are grown in these areas with good success.

Border irrigation is well suited to this soil. Land leveling is needed to obtain proper distribution of irrigation water and leach salts from the rooting zone.

The potential native vegetation on this soil is dominated by alkali sacaton. Greasewood, rabbitbrush, and cinquefoil are sparse. If the range deteriorates, the proportion of alkali sacaton decreases and the proportion of sedges, rushes, greasewood, and cinquefoil increases. Undesirable weeds and annual plants invade and become abundant if the range condition becomes poorer.

Seeding is generally not advisable because of the saline-alkali condition, wetness, and the high cost of land preparation. Control of excess water, renovating, deferred and rotation grazing, cross fencing, and brush control will prevent range deterioration and promote the growth of desirable plant species.

Rangeland wildlife including antelope, jackrabbit, cottontail, horned lark, and lark bunting are suited to the grassland habitat that develops on this soil. Proper livestock grazing, fencing which allows for free movement of antelope, and livestock water developments will increase rangeland wildlife populations. Where water is available, shallow water areas can be developed for wetland wildlife species.

Windbreaks and environmental plantings are generally not suited to this soil. Onsite investigation is needed to determine if plantings are feasible.

The major soil limitations for urban development are the high water table, frost action hazard, and flooding hazard. This soil needs drainage and protection from flooding, and roads and buildings need to be specially designed. Septic tank systems will not function properly because of the high water table and flood hazard. The capability subclasses are IIIw irrigated and VIw nonirrigated.

42—Platoro loam. This is a deep, well drained soil on alluvial fans and terraces at elevations of 7,600 to 7,900 feet. It formed in mixed alluvium derived mainly from basalt. The average annual precipitation is about 8 inches, the average annual air temperature is about 41 degrees F, and the frost-free period lasts about 95 days. Slopes are 0 to 1 percent.

Included in mapping are small areas of Graypoint gravelly sandy loam and Derrick cobbly sandy loam.

Typically, the surface layer is pale brown loam about 7 inches thick. The subsoil is brown clay loam and gravelly clay loam about 11 inches thick. The substratum is brown very gravelly clay loam about 6 inches thick over sand and gravel that extends to a depth of 60 inches.

Permeability is moderate. Available water capacity is moderate. Runoff is slow, and the erosion hazard is slight. The soil blowing hazard is moderate (fig. 8). Effective rooting depth is 60 inches or more.

This soil is used as native range and for irrigated alfalfa, potatoes (fig. 9), and small grains. Applications of commercial fertilizers and manure are commonly needed, and plant residues should be returned to the soil. Generally, all crops except legumes respond to nitrogen fertilizer, and all legumes respond to phosphate fertilizer.

Border, furrow, and sprinkler irrigation methods are suitable for this soil. Sprinkler irrigation is suited to most crops. The furrow method is well suited to row crops, and the border method is suited to alfalfa and small grains. Land leveling and proper lengths of run are needed to prevent seepage and salt buildup.

The potential native vegetation on this soil is dominated by Indian ricegrass, western wheatgrass, and blue grama. If the range deteriorates, the proportion of Indian ricegrass and western wheatgrass decreases and the amount of blue grama, squirreltail, threeawn, snakeweed, and rabbitbrush in the potential plant community increases. Undesirable weeds and annual plants invade and become abundant if the range condition becomes poorer.

Seeding is not advisable because of the low rainfall and the moderate available water capacity. Deferred grazing, cross fencing, and stock water developments prevent range deterioration and promote the growth of desirable plant species.

This soil provides a habitat best suited to openland and rangeland wildlife. On cropland, habitat for ring-necked pheasant, mourning dove, and many nongame species can be developed by establishing areas for nesting and escape cover. For pheasant, the inclusion of undisturbed nesting cover is vital to habitat development, especially in areas of intensive agriculture. Rangeland wildlife such as pronghorn antelope can be increased by development of livestock watering facilities and proper livestock grazing.

Urban development on this soil is limited by the texture of the substratum, which is gravelly below a depth of 26 inches and presents a caving hazard in excavating, and the rapid infiltration rate, which may cause pollution of ground water when sewage lagoons or trench-type sanitary landfills are used for waste disposal. The capability subclasses are IIIs irrigated and VIIs nonirrigated.

43—Quamon-LaJara complex. These nearly level soils are on flood plains and terraces along streams on the valley floor at elevations of 7,600 to 7,900 feet. The average annual precipitation is about 7 inches, the average annual air temperature is about 41 degrees F, and the frost-free season lasts about 95 days. The Quamon soil makes up about 45 percent of the map unit, and the LaJara soil makes up about 35 percent. Shawa soils make up about 10 percent, and similar soils that are gravelly or cobbly make up the remaining 10 percent. Slopes are 0 to 1 percent.

The Quamon soil is deep, moderately well drained, and gravelly. It formed in alluvium from mixed sources on terraces. Typically, the surface layer is brown gravelly sandy loam about 5 inches thick. The underlying material is brown gravelly sandy loam to a depth of 16 inches and is very gravelly sand to a depth of 60 inches.

Permeability is moderately rapid. Available water capacity is low, runoff is slow, and the erosion hazard is slight. A water table is 3 to 5 feet below the surface during the irrigation season.

The LaJara soil is deep and poorly drained. It formed in mixed alluvium on flood plains. Typically, the surface layer is grayish brown and gray, loam and sandy loam about 8 inches thick. The subsoil is mottled light brownish gray sandy loam. The substratum is variegated gray to brown sandy loam, loamy sand, and sand to a depth of 60 inches.

Permeability is moderately rapid. Available water capacity is moderate. Runoff is very slow, and the erosion hazard is slight. A seasonal high water table is within 1 foot of the surface in spring and early in summer. This soil is subject to frequent flooding by spring runoff. Effective rooting depth is 60 inches or more.

This complex is used as native range and as irrigated pasture and hayland. A few areas where drainage is established are used for alfalfa and small grains. Crop yields are limited because the soils are occasionally flooded or have a high water table during periods of high runoff. Soil drainage and land leveling are needed for irrigated crops, although land leveling may expose large areas of gravel and cobbles. Protection from flooding is necessary to dependable crop production. Water-tolerant species are the most suitable for pasture and hayland plantings.

Border irrigation is suited to areas that have been leveled. Contour ditches are suited to areas that are slightly undulating.

The potential native vegetation on Quamon soil is dominated by western wheatgrass and blue grama. On LaJara soil it is dominated by alkali sacaton and sedge. If the range deteriorates, the proportion of these desir-

able plants decrease, and the proportion of less desirable plants such as baltic rush, forbs, and woody shrubs increases. Undesirable weeds and annuals invade and become abundant if the range condition becomes poorer.

Seeding on this complex is generally not advisable due to wetness, flooding, and the high cost of land preparation. Renovating, deferred and rotation grazing, cross fencing, and brush control help prevent range deterioration and promote the growth of desirable plant species.

The Quamon soils is suited to narrowleaf cottonwood. It is capable of producing 7,000 board feet (Doyle rule) of merchantable timber per acre from a fully stocked, even-aged stand of 40-year-old trees. Harvesting wood crops is restricted during periods of high water.

The LaJara soil is well suited to shallow water developments created by excavation of pothole blasting of open water areas. Developments such as these increase waterfowl and shorebird populations. Because of the availability of water, this complex provides excellent waterfowl nesting cover if livestock grazing is carefully managed.

Urban development of this complex is limited by a high water table and frost action potential. Flooding is a hazard on the LaJara soil. It needs dikes or levees to protect against flooding and drainage systems to lower the ground water for construction of roads or buildings. The design of structures may need to be altered in some areas. Community or offsite sewage systems are necessary to prevent pollution of ground water. The capability subclasses are IVw irrigated and Vw nonirrigated.

44—Ryan Park sandy loam, 3 to 5 percent slopes. This is a deep, well drained soil on alluvial fans at elevations of 7,600 to 7,900 feet. It formed in mixed alluvium. The average annual precipitation is about 7 inches, the average annual air temperature is about 41 degrees F, and the average frost-free period lasts about 95 days.

Included in mapping are small areas of Garita cobbly loam and McGinty sandy loam.

Typically, the surface layer is brown sandy loam about 5 inches thick. The subsoil is yellowish brown and pale brown sandy loam about 27 inches thick. The substratum is pale brown loamy sand and sandy loam to a depth of 60 inches or more.

Permeability is moderately rapid. Available water capacity is moderate. Runoff is medium, the erosion hazard is moderate, and the soil blowing hazard is high. Effective rooting depth is 60 inches or more.

This soil is native range for cattle and sheep. The potential native vegetation is dominated by Indian ricegrass, sand dropseed, and blue grama. If the range deteriorates, the proportion of Indian ricegrass decreases and the proportion of sand dropseed, threeawn, pricklypear, forbs, and woody shrubs increases. Undesirable weeds and annual plants invade and become abundant if the range condition becomes poorer.

Seeding is not advisable because of low rainfall and the soil blowing hazard. Deferred grazing, cross fencing, stock water developments, and brush control are generally needed to prevent range deterioration and to promote the growth of desirable plant species.

Rangeland wildlife such as antelope, cottontail, coyote, and jackrabbit are best suited to the habitat on this droughty soil. Forage production is typically low, and livestock grazing needs to be managed carefully if wildlife and livestock share the range. Livestock watering developments are also important and are used by a variety of wildlife.

The major soil limitation for urban development is soil blowing when plant cover is removed. The capability subclass is VIIe nonirrigated.

45—San Arcacio sandy loam. This is a deep, moderately well drained soil on terraces and flood plains. It developed in mixed alluvium over sand and gravel at elevations of 7,600 to 7,800 feet. The average annual rainfall is about 7 inches, the average annual air temperature is about 41 degrees F, and the frost-free season lasts about 95 days. Slopes are 0 to 1 percent.

Included in mapping are small areas of San Arcacio sandy loam, saline, and Mishak loam, drained.

Typically, the surface layer is yellowish brown sandy loam about 8 inches thick. The subsoil layer is yellowish brown sandy clay loam about 7 inches thick. The substratum is light grayish brown sandy clay loam about 8 inches thick over sand and gravel that extends to a depth of 60 inches.

Permeability is moderate. Available water capacity is moderate. Runoff is slow, and the erosion hazard is slight. The water table is within 3 to 4 feet of the surface during the irrigation season. Effective rooting depth is 60 inches or more.

This soil is almost entirely in irrigated alfalfa, potatoes (fig. 10), and small grains. A few small areas are native range. Applications of commercial fertilizers and manure are generally needed on irrigated cropland, and plant residues should be returned to the soil. Generally, all crops except legumes respond to nitrogen and phosphate fertilizers. Legumes respond to phosphate fertilizers.

Border, furrow, and sprinkler irrigation methods are suitable for this soil. Sprinklers are well suited to most crops. The furrow method is suited to row crops. Border irrigation is well suited to alfalfa, small grains, and pasture. Regardless of the irrigation method used, water must be applied carefully to prevent seepage and salt buildup in the soil. Land leveling and soil drainage systems are generally needed for furrow or border irrigation.

The potential native vegetation on this soil is dominated by alkali sacaton, western wheatgrass, and blue grama. Greasewood, rabbitbrush, and inland saltgrass are prominent but widely spaced. If the range deteriorates, the proportion of desirable grasses such as alkali sacaton and western wheatgrass decreases and the pro-

portion of greasewood, rabbitbrush, and inland saltgrass increases. Undesirable weeds and annual plants invade and become abundant if the range condition becomes poorer.

Seeding is not advisable because of the low rainfall. Deferred grazing, cross fencing, stock water development, and brush control help prevent range deterioration and promote growth of desirable plant species. This soil is not suited to windbreak and environmental plantings unless irrigated.

Rangeland wildlife such as antelope, cottontail, coyote, and jackrabbit are best suited to the habitat on this droughty soil. Forage production is typically low, and livestock grazing needs to be managed properly if wildlife and livestock share the range. Livestock watering developments are also important and are used by various wildlife species.

Major limitations for urban development of this soil are the high water table and high permeability in the gravelly substratum. Dwellings with basements are generally not suited to this soil because of the water table. Septic tanks, sewage lagoons, and trench-type sanitary landfills can cause pollution of ground water. Dwellings without basements and offsite sewage and solid waste disposal systems are generally suitable for this soil. The capability subclasses are IIIs irrigated and VIIs nonirrigated.

46—San Arcacio sandy loam, saline. This is a deep, wet soil on terraces and flood plains. It developed in mixed alluvium over sand and gravel at elevations of 7,600 to 7,800 feet. The average annual precipitation is about 7 inches, the average annual air temperature is about 41 degrees F, and the frost-free season lasts about 95 days. Slopes are 0 to 1 percent.

Included in mapping are small areas of Mishak loam and Zinzer loam, saline.

Typically, the surface layer is yellowish brown, salt-affected sandy loam about 8 inches thick. The subsoil is yellowish brown sandy clay loam about 7 inches thick. The substratum is light grayish brown sandy clay loam about 8 inches thick over sand and gravel that extends to a depth of 60 inches.

Permeability is moderate. Available water capacity is moderately low. Runoff is slow, and the erosion hazard is slight. A high water table is within 1 1/2 to 3 feet of the surface during the irrigation season.

This soil is used almost entirely as native range and irrigated pasture. Salt- and water-tolerant plants are necessary to seeding irrigated pasture.

Border irrigation is well suited to this soil. Soil drainage, leaching, and land leveling promote plant growth and decrease the salt concentration in the rooting zone.

The potential native vegetation on this soil is dominated by alkali sacaton and inland saltgrass. Greasewood, rabbitbrush, and sedge are prominent but widely spaced. If the range deteriorates, the proportion of alkali sacaton decreases and the proportion of greasewood, rabbitbrush, and inland saltgrass increase. Undesirable weeds and annual plants invade and become abundant if the range condition becomes poorer.

Seeding is not advisable because of salts and wetness. Deferred grazing, cross fencing, stock water development, and brush control help prevent range deterioration and promote the growth of desirable plant species.

This soil is generally not suited to windbreak and environmental plantings. Onsite investigation is needed to determine if plantings are feasible.

Rangeland wildlife including antelope, jackrabbit, cottontail, horned lark, and lark bunting are suited to the grassland habitat that develops on this soil. Proper livestock grazing, fencing which allows for free movement of antelope, and livestock water developments increase rangeland wildlife populations. In irrigated areas, shallow water areas can be developed for wetland wildlife.

Major limitations for urban development of this soil are the high water table and frost action hazard. The soil needs to be drained, Type II cement used, and designs modified for construction of roads and buildings. Offsite sewage and waste disposal systems are needed to prevent pollution of the ground water. The capability subclasses are IIIw irrigated and VIIs nonirrigated.

47—Seitz very stony loam, 10 to 65 percent slopes. This is a deep, well drained soil on mountainsides and ridges. It developed in slope wash from igneous rock at elevations of 9,600 to 11,000 feet. The average annual precipitation is about 18 inches, the average annual air temperature is about 38 degrees F, and the frost-free season lasts about 60 days.

Included in mapping are small areas of Bushvalley very stony loam, 10 to 40 percent slopes, and rock outcrop.

Typically, there is a thin organic layer of partially decomposed needles and twigs over a dark grayish brown very stony loam surface layer about 2 inches thick. The subsurface layer is pinkish gray very stony loam about 15 inches thick. The subsoil is light brown very stony clay and heavy clay loam about 13 inches thick. The substratum is brown very stony clay loam to a depth of 60 inches.

Permeability is slow. Available water capacity is moderate. Runoff is rapid, and the erosion hazard is moderate. Effective rooting depth is 60 inches or more.

This Seitz soil is mainly woodland. It is suited to Engelmann spruce. It is capable of producing 3,200 cubic feet of merchantable timber from a fully stocked, even-aged stand of 80-year-old trees. Stones in the surface layer (fig. 11) affect felling, yarding, and other equipment operations. Special attention should be given to keeping soil erosion to a minimum during harvest. The moderate available water capacity of the soil may decrease seedling survival.

The understory vegetation is dominated by Thurber fescue and scattered amounts of Parry oatgrass, nodding brome, slender and bearded wheatgrass, and big

bluegrass. Small amounts of big sagebrush, snowberry, and cinquefoil are also present.

This soil provides a habitat for woodland wildlife such as blue grouse, snowshoe hare, and black bear. It also furnishes range for mule deer and elk. Wildlife populations can be increased through proper livestock grazing and by clear cutting openings in the stands of Engelmann spruce and subalpine fir to remove overstory competition. This provides space for more of the grasses and various forbs eaten by deer and elk.

Large stones and steep slopes are limitations for urban development of the soil. Heavy equipment must be used and building and road sites carefully selected. Special attention should be given to disturbing as little vegetation as possible on construction sites, and special measures are needed to help prevent erosion. The capability subclass is VIIs.

48—Shawa loam, 0 to 1 percent slopes. This is a deep, well drained or moderately well drained soil on alluvial fans and terraces at elevations of 7,600 to 8,400 feet. It formed in mixed alluvium derived primarily from igneous rock. The average annual precipitation is about 14 inches, the average annual air temperature is about 41 degrees F, and the frost-free period lasts about 95 days.

Included in mapping are small areas of Dunul gravelly sandy loam and Mogote loam.

Typically, the upper part of the surface layer is dark grayish brown loam about 4 inches thick. The lower part is dark grayish brown clay loam and loam about 20 inches thick. The underlying material is brown loam to a depth of 60 inches.

Permeability is moderate. Available water capacity is high. Runoff is slow, the erosion hazard is slight, and the soil blowing hazard is moderate. Effective rooting depth is 60 inches or more.

This soil is used for native range, irrigated pasture, potatoes, small grains, and alfalfa. Applications of commercial fertilizers and manure are commonly needed, and plant residues should be returned to the soil. Generally, all crops except legumes respond to applications of nitrogen fertilizer and all legumes respond to phosphate fertilizer.

This soil is suitable for border, furrow, and sprinkler irrigation methods. The method used is generally governed by the crop. Sprinklers are well suited to most crops. The furrow method is suited to row crops, and the border method is suited to alfalfa, small grains, and pasture.

The potential native vegetation on this soil is dominated by western wheatgrass and needleandthread. If the range deteriorates, the proportion of these desirable plants decreases and the proportion of blue grama, squirreltail, sand dropseed, forbs, and woody shrubs increases. Undesirable shrubs, weeds, and annual plants invade and become abundant if the range condition becomes poorer.

Seeding is possible, but soil blowing may be a hazard if the soil is left without cover for a long period during spring. Adapted species are Nordan crested wheatgrass, Siberian wheatgrass, pubescent wheatgrass, western wheatgrass, and Russian wildrye. Seeding in conjunction with pitting is advisable. Seedings in late summer have proven most successful. Deferred grazing, cross fencing, and stock water developments are generally needed to prevent range deterioration and to promote the growth of desirable plant species.

This soil provides a habitat best suited to openland and rangeland wildlife. On cropland, habitat for ringnecked pheasant, mourning dove, and many nongame species can be developed by establishing areas for nesting and escape cover. For pheasant, the inclusion of undisturbed nesting cover is vital, especially in areas of intensive agriculture. Rangeland wildlife, such as pronghorn antelope, can be increased by development of livestock watering facilities and proper livestock grazing.

Soil limitations for urban development are the limited load-bearing capacity and frost action potential. Dwelling and road designs need to be modified to offset these limitations. Septic tank systems may not be satisfactory for other than widely spaced, single-family dwellings, due to the moderate permeability of the soil. The capability subclasses are IIIe irrigated and VIe nonirrigated.

49—Shawa loam, 1 to 3 percent slopes. This is a deep, well drained soil on alluvial fans and terraces at elevations of 7,800 to 8,500 feet. It formed in mixed alluvium derived primarily from igneous rock. The average annual precipitation is about 12 inches, the average annual air temperature is about 41 degrees F, and the frost-free period lasts about 95 days.

Included in mapping are small areas of Dunul gravelly sandy loam and Mogote loam.

Typically, the upper part of the surface layer is dark grayish brown loam about 4 inches thick. The lower part is dark grayish brown clay loam and loam about 20 inches thick. The underlying material is brown loam to a depth of 60 inches.

Permeability is moderate. Available water capacity is high. Runoff is slow, and the erosion hazard is slight. The soil blowing (fig. 12) hazard is moderate. Effective rooting depth is 60 inches or more.

This soil is used for native range, irrigated pasture, potatoes, small grains, and alfalfa. Applications of commercial fertilizers and manure are commonly needed, and plant residues should be returned to the soil. Generally, all crops except legumes respond to applications of nitrogen fertilizer, and legumes respond to applications of phosphate fertilizer.

This soil is suitable for sprinkler, furrow, and border irrigation methods. Sprinklers are well suited to most crops. The furrow method is suited to row crops, and the border method is suited to alfalfa, small grains, and pasture. Land leveling is generally needed for border and

furrow irrigation, and lengths of run need to be adjusted to prevent water loss and soil erosion.

The potential native vegetation on this soil is dominated by western wheatgrass and needleandthread. If the range deteriorates, the proportion of these desirable plants decreases and the proportion of blue grama, squirreltail, sand dropseed, forbs, and woody shrubs increases. Undesirable shrubs, weeds, and annual plants invade and become abundant if the range condition becomes poorer.

Seeding is possible, but soil blowing may be a hazard if the soil is left without cover for a long period during the spring. Adapted species are Nordan crested wheatgrass, Siberian wheatgrass, pubescent wheatgrass, western wheatgrass, and Russian wildrye. Plowing or discing and drilling should be done on the contour or across the slope to minimize runoff and soil loss before the grasses become established. Seeding in conjunction with pitting is also advisable. Seedings in late summer have proven most successful. Deferred grazing, cross fencing, and stock water developments are generally needed to prevent range deterioration and to promote the growth of desirable plant species.

This soil provides a habitat best suited to openland and rangeland wildlife. On cropland, habitat for ringnecked pheasant, mourning dove, and many nongame species can be developed by establishing areas for nesting and escape cover. For pheasant, the inclusion of undisturbed nesting cover is vital, especially in areas of intensive agriculture. Rangeland wildlife, exemplified by the pronghorn antelope, can be increased by development of livestock watering facilities and proper livestock grazing.

Soil limitations for urban development are the limited load-bearing capacity and potential frost action. Dwelling and road designs need to be modified to offset these limitations. Septic tank systems may not be satisfactory for other than widely spaced, single-family dwellings, due to the moderate permeability of the soil. The capability subclasses are IIIe irrigated and VIe nonirrigated.

50—Shawa loam, wet. This is a deep soil on alluvial fans and low terraces at elevations of 7,600 to 8,400 feet. It formed in mixed alluvium derived mainly from igneous rock. The average annual precipitation is about 12 inches, the average annual air temperature is about 41 degrees F, and the frost-free period lasts about 95 days. Slopes are 0 to 1 percent.

Included in mapping are small areas of LaJara, Lamanga, and Quamon soils.

Typically, the upper part of the surface layer is dark grayish brown loam about 4 inches thick. The lower part is dark grayish brown clay loam and loam about 20 inches thick. The underlying material is brown loam to a depth of 60 inches.

Permeability is moderate. Available water capacity is high. Runoff is slow, and the erosion hazard is slight. A seasonal high water table is within 2 to 4 feet of the surface during the irrigation season because of excessive seepage from irrigation ditches. Flooding occurs in about 3 years out of 10 in the spring when streams are high (fig. 13). Effective rooting depth is 60 inches or more.

This soil is used for native range and irrigated pasture and hayland, and a few small areas are in irrigated small grains. Applications of commercial fertilizers and manure are commonly needed, and plant residues should be returned to the soil. Generally, all crops except legumes respond to nitrogen fertilizer, and legumes respond to phosphate fertilizer.

The potential native vegetation on this soil is dominated by western and slender wheatgrasses in the drier areas and by tufted hairgrass, bluejoint reedgrass, and sedge in the wetter areas. If the range deteriorates, the proportion of these desirable plants decreases and the proportion of less desirable plants such as rush, forbs, and woody shrubs increases. Undesirable weeds and annuals invade and become abundant if the range condition becomes poorer.

Seeding is generally not advisable because of wetness and the high cost of land preparation. Renovating, deferred and rotation grazing, cross fencing, and brush control help prevent range deterioration and promote the growth of desirable plant species.

This soil is suited to the production of narrowleaf cottonwood. It is capable of producing 7,000 board feet (Doyle rule) of merchantable timber per acre from a fully stocked even-aged stand of 40-year-old trees. Harvesting wood crops may be restricted during periods of high water.

Rangeland wildlife, such as deer and cottontail, use areas where excellent cover is provided by willows, rushes, and other wetland vegetation. Wildlife on this soil can best be aided by proper livestock grazing and by allowing natural vegetation, such as willows and cattails, to develop.

Flooding, a seasonal high water table, frost action potential, and low bearing strength are the greatest limitations to urban development of this soil. The soil needs to be drained and protected from flooding, and designs for roads and buildings need to be modified to offset these limitations. Septic tank systems will not function properly on this soil and may pollute ground water. The capability subclasses are IIIw irrigated and Vw nonirrigated.

51—Space City loamy fine sand, 1 to 9 percent slopes. This is a deep, somewhat excessively drained soil along the base of basalt hills and mesas at elevations of 7,600 to 8,000 feet. It formed in wind-reworked alluvium from mixed sources. The average annual precipitation is about 7 inches, the average annual air temperature is about 41 degrees F, and the frost-free season lasts about 95 days.

Included in mapping are small areas of Space City soils that are 25 percent gravel and cobbles and some small areas of Ryan Park sandy loam.

Typically, the surface layer is light brownish gray loamy fine sand about 4 inches thick. The underlying material is light brownish gray loamy sand and loamy fine sand to a depth of 60 inches.

Permeability is rapid. Available water capacity is low. Runoff is slow, the erosion hazard is slight, and the soil blowing hazard is high. Effective rooting depth is 60 inches or more.

This soil is used as native range for sheep and cattle. The potential native vegetation is dominated by Indian ricegrass, needleandthread, spike dropseed, and blue grama. If the range deteriorates, the proportion of Indian ricegrass and needleandthread decreases and the proportion of sand dropseed, threeawn, pricklypear, forbs, and woody shrubs increases. Undesirable weeds and annual plants invade and become abundant if the range condition becomes poorer.

Seeding is not advisable because of the low rainfall and low available water capacity. Deferred grazing, cross fencing, stock water developments, and brush control are generally needed to prevent range deterioration and to promote the growth of desirable plant species.

Rangeland wildlife, such as antelope, cottontail, coyote, and jackrabbit, are best suited to the habitat on this droughty soil. Forage production is typically low, and proper livestock grazing is necessary if wildlife and livestock share the range. Livestock watering developments are used by a variety of wildlife.

Major limitations for urban development of the soil are the soil blowing hazard, rapid permeability, and caving hazard. Special care is needed when excavating to prevent cave-ins. Plant cover should be disturbed as little as possible during construction to minimize soil blowing. Sewage lagoons and trench-type sanitary landfills may contaminate ground water due to the rapid permeability of the soil. Ponds and reservoirs built on this soil require sealing with clay or other material to prevent seepage and water loss. The capability subclass is VIIe.

52—Stunner loam. This is a deep, well drained soil on fans at elevations of 7,800 to 8,400 feet. It formed in calcareous alluvium derived mainly from basalt rock. The average annual precipitation is about 10 inches, the average annual air temperature is about 41 degrees F, and the frost-free season lasts about 95 days. Slopes are 0 to 3 percent.

Included in mapping are small areas of Luhon loam, Monte loam, and Platoro loam.

Typically, the surface layer is yellowish brown loam about 5 inches thick. The subsoil is brown and light brown clay loam about 16 inches thick. The substratum is light brown loam to a depth of 60 inches.

Permeability is moderate. Available water capacity is high. Runoff is slow, and the erosion hazard is slight. Effective rooting depth is 60 inches or more.

This soil is used as native range for sheep and cattle. The potential native vegetation is dominated by winterfat, squirreltail, and blue grama with scattered amounts of big sagebrush and sand dropseed. If the range deteriorates, the proportion of winterfat decreases and the proportion of big sagebrush, tall rabbitbrush, blue grama, sand dropseed, and forbs increases. Undesirable forbs and annual weeds invade and become abundant if the range condition becomes poorer.

Seeding is possible if the range resource has been depleted. Adapted species are Russian wildrye, Nordan crested wheatgrass, Siberian wheatgrass, or pubescent wheatgrass. Plowing or discing and drilling should be done on the contour or across the slope to minimize runoff and soil loss before the grasses become established. Seedings in late summer have proven most successful. Deferred grazing, cross fencing, stock water developments, brush control, and erosion control structures are generally needed to prevent range deterioration and to promote the growth of desirable plant species.

Rangeland wildlife, such as antelope, cottontail, coyote, and jackrabbit, are best suited to the habitat on this soil. Forage production is often low, and livestock grazing needs careful management if wildlife and livestock share the range. Livestock watering developments are used by a variety of wildlife.

Urban development is limited by the low bearing strength and swelling of the soil when wet and shrinking when dry. The designs for roads and buildings need to be modified to offset these soil features. Plant cover should be disturbed as little as possible during construction to keep soil loss at a minimum. The capability subclass is VIe.

53—Travelers very stony loam, 1 to 3 percent slopes. This is a shallow, somewhat excessively drained soil on low ridges and mesa tops at elevations of 7,600 to 8,300 feet. It formed in material weathered from basalt. The average precipitation is about 9 inches, the average annual air temperature is about 41 degrees F, and the frost-free season lasts about 90 days.

Included in mapping are small areas of Garita cobbly loam and Luhon loam. Also included are areas containing basalt outcrop.

Typically, the surface layer is brown very stony loam about 4 inches thick. The subsoil is pale brown very stony loam about 8 inches thick. The substratum is very pale brown very stony loam about 4 inches thick over basalt.

Permeability is moderate. Available water capacity is very low. Runoff is medium, and the erosion hazard is moderate. Effective rooting depth is about 10 to 20 inches.

This soil is used as native range for sheep and cattle. The potential native vegetation on this soil is dominated by winterfat, fourwing saltbush, Indian ricegrass, and blue grama. If the range deteriorates, the proportion of these desirable plants decreases and the proportion of plants

such as threeawn, pricklypear, snakeweed, and other forbs increases. Undesirable weeds and annual plants invade and become abundant if the range condition becomes poorer.

Seeding is not advisable because of the low rainfall, very low available water capacity, and very stony soil. Deferred grazing, cross fencing, and stock water developments help prevent range deterioration and promote the growth of desirable plant species.

Rangeland wildlife, such as antelope, cottontail, coyote, and jackrabbit, are best suited for the habitat on this droughty soil. Forage production is typically low, and livestock grazing needs careful management if wildlife and livestock share the range. Livestock watering developments are used by a variety of wildlife species.

Urban development is limited by the shallow depth to bedrock and large stones (fig. 14). Building and road designs can be modified to offset these limitations. Difficulty in the installation of water and sewer lines may be partially overcome by the use of heavy equipment or blasting. Septic tank systems and trench-type sanitary landfills are not suited to this shallow soil. The capability subclass is VIIs.

54—Travelers very stony loam, 3 to 25 percent slopes. This is a shallow, excessively drained soil on hills, ridges, and mesas at elevations of 7,600 to 8,500 feet. It formed in material weathered from basalt. The average annual precipitation is about 9 inches, the average annual air temperature is about 41 degrees F, and the frost-free season lasts about 90 days.

Included in mapping are small areas of Garita cobbly loam, Monte loam, and Cumbres loam. Also included are areas of basalt outcrop and some very steep to extremely steep bedrock escarpments ranging in height from a few feet to 100 feet or more.

Typically, the surface layer is brown very stony loam about 4 inches thick. The subsoil is pale brown very stony loam about 8 inches thick. The substratum is very pale brown very stony loam about 4 inches thick over basalt.

Permeability is moderate. Available water capacity is very low. Runoff is medium to rapid, and the erosion hazard is moderate to high. Effective rooting depth is about 10 to 20 inches.

This soil is used as native range for sheep and cattle. The potential native vegetation is dominated by Indian ricegrass, winterfat, blue grama, and smaller amounts of fourwing saltbush, rabbitbrush, and sand dropseed. If the range deteriorates, the proportion of Indian ricegrass and winterfat decreases and the proportion of sand dropseed, blue grama, threeawn, pricklypear, forbs, and woody shrubs increases. Undesirable weeds and annual plants invade and become abundant if the range condition becomes poorer.

Seeding is not advisable because of the low rainfall, steep slope, stones, very low available water capacity, and lack of soil depth. Deferred grazing is generally needed to prevent range deterioration and to promote the growth of more desirable plant species.

Rangeland wildlife, such as antelope, cottontail, coyote, and jackrabbit are best suited to the habitat on this droughty soil. Forage production is typically low, and livestock grazing needs to be managed carefully if wildlife and livestock share the range. Livestock watering developments are used by a variety of wildlife.

Urban development of the soil is limited by the shallow depth to bedrock, large stones, and slope. Special designs are needed for roads and buildings. Special equipment and blasting may be necessary for construction. Septic tank systems are not suitable for this steep, shallow soil. The capability subclass is VIIs.

55—Vastine loam. This is a deep, poorly drained soil on flood plains and low terraces at elevations of 7,500 to 7,800 feet. It formed in mixed alluvium derived mainly from igneous rock. The average annual precipitation is about 7 inches, the average annual air temperature is about 41 degrees F, and the frost-free season lasts about 95 days. Slopes are 0 to 1 percent.

Included in mapping are small areas of Alamosa loam, LaJara loam, and LaSauses clay loam.

Typically, the surface layer is gray loam and clay loam about 12 inches thick. The subsoil is gray, pale brown and brownish yellow clay loam and loam about 25 inches thick. The substratum is fine sand to a depth of 60 inches.

Permeability is moderate. Available water capacity is high. Runoff is slow, and the erosion hazard is slight. Flooding is common in most areas from April until July in most years. A seasonal high water table is generally 1 to 2 1/2 feet from the surface. Effective rooting depth is about 60 inches or more.

This soil is used for native range, irrigated pasture and hayland, and, in some small areas where drainage is established, irrigated crops.

The soil needs drainage, land leveling, and protection from flooding for crop production. Alfalfa, grasses, and small grains are suited when drainage is established. Water-tolerant plants are best suited to pasture seeding where this soil is not drained. Border irrigation is generally suited to all crops.

The potential native vegetation in the drier areas is dominated by western and slender wheatgrasses. Tufted hairgrass and sedge are dominant in the wetter areas. If the range deteriorates, the proportions of these desirable plants decrease and the proportion of less desirable plants such as rush, forbs, and woody shrubs increases. Undesirable weeds and annuals invade and become abundant if the range condition becomes poorer.

Seeding is generally not advisable due to the wetness and the high cost of land preparation. Renovating, deferred and rotation grazing, cross fencing, and brush control help prevent range deterioration and promote the growth of desirable plant species.

This soil is suited to windbreaks and environmental plantings. Poor drainage and plant competition are the principal limitations to establishing tree and shrub plantings. Rodent damage is also a hazard to seedlings. Weed control and proper plant selection ensure survival of plantings. Trees that are best suited and have good survival rates are cottonwood, golden willow, and blue spruce. Shrubs best suited include purple willow, common chokecherry, and caragana.

This soil is well suited to shallow water developments which use open water areas created by excavation or pothole blasting. Developments such as these increase waterfowl and shorebird populations. Because of the availability of water, this soil provides excellent waterfowl nesting cover if livestock grazing is carefully managed.

Flooding, high water table, and frost action hazard are major limitations for urban development on this soil. It needs to be drained and protected from flooding for any type of construction. Drainage outlets may be difficult to obtain. Septic tank systems, which are not suited to this soil, can pollute ground water and nearby streams. The capability subclasses are IIIw irrigated and Vw nonirrigated.

56—Zinzer loam. This is a deep, well drained soil on fans and terraces at elevations of 7,500 to 7,800 feet. It formed in mixed alluvium derived mainly from igneous rock. The average annual precipitation is about 7 inches, the average annual air temperature is about 41 degrees F, and the frost-free season lasts about 95 days. Slopes are 0 to 1 percent.

Included in mapping are small areas of San Arcacio and Acacio soils. There are also some small areas of Zinzer soils with slopes of 1 to 3 percent along narrow edges of terraces.

Typically, the surface layer is brown and yellowish brown loam about 11 inches thick. The underlying material above a depth of 17 inches is yellowish brown loam, over pale brown and yellowish brown sandy clay loam and clay loam that extends to a depth of 60 inches or more.

Permeability is moderate. Available water capacity is high. Runoff is slow, and the erosion hazard is slight. Effective rooting depth is 60 inches or more.

This soil is used for native range and for irrigated alfalfa, small grains, and potatoes. Applications of commercial fertilizers and manure are commonly needed, and plant residues should be returned to the soil. Generally, all crops except legumes respond to applications of nitrogen and phosphate fertilizer. Legumes respond to phosphate fertilizers.

This soil is suitable for sprinkler, border, and furrow irrigation methods. Sprinklers are well suited to most crops. Borders are well suited to alfalfa, small grains, and pasture. Land leveling is needed for border and furrow irrigation to help obtain proper water distribution. Regardless of the method used, water must be applied carefully to avoid waterlogging of the soil and salt buildup in the surface layer.

The potential native vegetation on this soil is dominated by alkali sacaton, western wheatgrass, and creeping wildrye. Greasewood, rabbitbrush, and inland saltgrass are prominent but widely spaced. If the range deteriorates, the proportion of desirable grasses such as alkali sacaton and western wheatgrass decreases and the proportion of greasewood, rabbitbrush, and inland saltgrass increases. Undesirable weeds and annual plants invade and become abundant if the range condition becomes poorer.

Seeding is not advisable because of the low rainfall. Irrigation is necessary for seedling development. Deferred grazing, cross fencing, stock water development, and brush control help prevent range deterioration and promote growth of desirable plant species.

Unless irrigated, this soil is not suited to windbreak and environmental plantings. Onsite investigation is needed to determine if plantings are feasible. Rangeland wildlife, such as antelope, cottontail, coyote, and jackrabbit are best suited to the habitat on this soil. Forage production is typically low, and proper livestock grazing management is necessary if wildlife and livestock share the range. Livestock watering developments are used by a variety of wildlife. Where the soil is irrigated, openland wildlife can be increased if food and cover is provided.

Soil limitations for urban development include low bearing strength and frost action hazard. Modifying the designs of roads and buildings and draining the soil will offset these limiting factors. Use of septic tank systems for other than widely spaced, single-family dwellings is generally not satisfactory on this soil. The capability subclasses are IIIs irrigated and VIIs nonirrigated.

57—Zinzer loam, saline. This is a deep, somewhat poorly drained soil on fans and terraces at elevations of 7,500 to 7,800 feet. It formed in mixed alluvium derived mainly from igneous rock. The average annual precipitation is about 7 inches, the average annual air temperature is about 41 degrees F, and the frost-free season lasts about 95 days. Slopes are 0 to 3 percent.

Included in mapping are small areas of San Arcacio sandy loam, saline.

Typically, the surface layer is brown and yellowish brown loam about 11 inches thick. The underlying material above a depth of 17 inches is yellowish brown loam. Beneath this is pale brown and yellowish brown sandy clay loam and clay loam that extends to a depth of 60 inches.

Permeability is moderate. Available water capacity is high. Runoff is slow, and the erosion hazard is slight. A seasonal high water table is within 2 to 4 feet of the surface during the irrigation season because of seepage from irrigation ditches and excessive irrigation of high areas. Effective rooting depth is 60 inches or more.

This soil is used for native range and for irrigated pasture and hay. Drainage and leaching to remove salts

are necessary for crop production. Land leveling is necessary for proper water distribution. All crops adapted to the area are suited to this soil if it is drained and leached. Border and sprinkler irrigation are the methods best suited to pasture and small grains.

The potential native vegetation on this soil is dominated by alkali sacaton and inland saltgrass. Greasewood, rabbitbrush, and rush are prominent but widely spaced. If the range deteriorates, the proportion of desirable grasses, such as alkali sacaton, decreases and the proportion of greasewood, rabbitbrush, and inland saltgrass increases. Undesirable weeds and annual plants invade and become abundant if the range condition becomes poorer.

Seeding is not advisable because of salts and low rainfall. Irrigation is necessary for seedling development. Deferred grazing, cross fencing, stock water development, and brush control help prevent range deterioration and promote the growth of desirable plant species.

Rangeland wildlife, such as antelope, cottontail, coyote, and jackrabbit, are best suited to the habitat on this soil. Forage production is typically low, and livestock grazing needs to be managed carefully if wildlife and livestock share the range. Livestock watering developments are used by a variety of wildlife.

Where this soil is irrigated, openland wildlife can be increased by providing food and cover.

Soil limitations for urban development include the high water table, low load-bearing strength, and high frost action hazard. The soil needs to be drained and designs of roads and buildings modified to offset these limitations. Septic tank systems are not suited to this soil because of the high water table. The capability subclasses are IIIw irrigated and VIIs nonirrigated.

Use and management of the soils

The soil survey is a detailed inventory and evaluation of the most basic resource of the survey area—the soil. It is useful in adjusting land use, including urbanization, to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in uses of the land.

While a soil survey is in progress, soil scientists, conservationists, engineers, and others keep extensive notes about the nature of the soils and about unique aspects of behavior of the soils. These notes include data on erosion, drought damage to specific crops, yield estimates, flooding, the functioning of septic tank disposal systems, and other factors affecting the productivity, potential, and limitations of the soils under various uses and management. In this way, field experience and measured data on soil properties and performance are used as a basis for predicting soil behavior.

Information in this section is useful in planning use and management of soils for crops and pasture, rangeland, and woodland, as sites for buildings, highways and other transportation systems, sanitary facilities, and parks and other recreation facilities, and for wildlife habitat. From the data presented, the potential of each soil for specified land uses can be determined, soil limitations to these land uses can be identified, and costly failures in houses and other structures, caused by unfavorable soil properties, can be avoided. A site where soil properties are favorable can be selected, or practices that will overcome the soil limitations can be planned.

Planners and others using the soil survey can evaluate the impact of specific land uses on the overall productivity of the survey area or other broad planning area and on the environment. Productivity and the environment are closely related to the nature of the soil. Plans should maintain or create a land-use pattern in harmony with the natural soil.

Contractors can find information that is useful in locating sources of sand and gravel, roadfill, and topsoil. Other information indicates the presence of bedrock, wetness, or very firm soil horizons that cause difficulty in excavation.

Health officials, highway officials, engineers, and many other specialists also can find useful information in this soil survey. The safe disposal of wastes, for example, is closely related to properties of the soil. Pavements, sidewalks, campsites, playgrounds, lawns, and trees and shrubs are influenced by the nature of the soil.

Crops and pasture

The major management concerns in the use of the soils for crops and pasture are described in this section. In addition, the crops or pasture plants best suited to the soil, including some not commonly grown in the survey area, are discussed; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are presented for each soil.

This section provides information about the overall agricultural potential of the survey area and about the management practices that are needed. The information is useful to equipment dealers, land improvement contractors, fertilizer companies, processing companies, planners, conservationists, and others. For each kind of soil, information about management is presented in the section "Soil maps for detailed planning." Planners of management systems for individual fields or farms should also consider the detailed information given in the description of each soil.

More than 122,000 acres in the survey area was in irrigated crops, hayland, and pasture according to the 1969 Conservation Needs Inventory. Of this total, 35,000 acres was used for rotation hay and pasture, 7,000 acres for row crops, 37,000 acres for close-grown crops, 3,000 acres for summer fallow, and 40,000 acres for permanent hay and pasture.

The potential of the soils is fair for increased crop production. Bringing more land under cultivation is not likely because of the dry climate and the lack of additional irrigation water. Drainage of some of the seeped soils and more efficient irrigated methods may make more water available in the future and allow more land to be cultivated. These practices will also improve the productivity of land that is currently cultivated.

Minimum tillage and leaving crop residues on the surface help to reduce the hazards of erosion. Leaving fall-plowed fields with a rough surface helps reduce wind erosion in spring.

Information on the design of erosion control practices for each kind of soil is contained in the Technical Guide, available in local offices of the Soil Conservation Service.

Soil drainage is a major management need on about half of the irrigated cropland and hayland in the survey area. Some soils are so naturally wet that crops are generally not possible. These are Shawa loam, and wet; Aquolls and Aquents; and LaJara, Mishak, and Vastine soils. Because of the nearly flat relief of the valley floor and limited natural drainageways, outlets for drainage systems are difficult, and often costly, to obtain. In areas where irrigation has caused seepage and in other areas where the water table is seasonally high, salts and alkali reduce crop yields or limit the kinds of plants that grow without drainage and soil amendments such as gypsum and sulfuric acid (*5, 9*).

Information on drainage design for each kind of soil is contained in the Technical Guide, available in local offices of the Soil Conservation Service.

Soil fertility is naturally somewhat low in most of the soils in the valley part of the survey area. Most soils are mildly to moderately alkaline and are high in calcium and potassium. Some soils that have a high water table are strongly or very strongly alkaline and are high in sodium and calcium. The salts and alkali tend to make nutrients in the soil less available to most plants. Soils that are saline or alkali include Hooper, Mosca, Arena, LaSauses, Mishak, San Arcacio, and Zinzer soils. Some soils, such as Hooper and Arena soils, are not suitable for crops without expensive reclamation. Additions of fertilizer and soil amendments should be based on the results of soil tests, on the need of the crop, and on the expected yields. The Cooperative Extension Service can help in determining the kinds and amounts of fertilizer and soil amendments to apply.

Soil tilth is important in the germination of seeds and in the infiltration of water into the soil. Soils with good tilth are granular and porous. Most of the soils used for crops in the survey area have a sandy loam surface layer that is light in color and low in content of organic matter. Regular use of crop residues, manure, and other organic material improves soil structure and reduces crust formation.

Field crops suited to the soils and climate of the survey area are potatoes, barley (for livestock feed and malting), and oats. Alfalfa and grasses such as brome, orchardgrass, and Russian wildrye are grown for hay and pasture.

Special crops grown commercially in the survey area include head lettuce and field peas. Potatoes are best suited to loamy sands and sandy loams, such as the McGinty, Mosca, San Arcacio, and Graypoint soils. All other adapted crops also grow well on these soils.

Latest information and suggestions for growing special crops can be obtained from local offices of the Cooperative Extension Service and the Soil Conservation Service.

Soil erosion is a major problem on about 10 percent of the cropland. Fall-plowed soils that have sandy surface layers, such as Mosca, McGinty, and San Arcacio soils, are particularly prone to erosion.

Loss of the surface layer through erosion is damaging for two reasons. First, productivity is reduced as subsoil is incorporated into the plow layer. This can be especially damaging on soils that have a clay loam subsoil, such as Platoro and Stunner soils, or that tend to be droughty, such as Graypoint gravelly sandy loam, Derrick very cobbly sandy loam, and Dunul gravelly sandy loam. Second, the eroded soil enters streams as sediment. Control of erosion minimizes the pollution of streams by sediment and improves the quality of water for municipal use, recreation, and wildlife.

Erosion control practices provide protective surface cover, reduce runoff, and increase infiltration of the soil. A cropping system that keeps vegetative cover on the soil for extended periods can hold soil loss to an amount that will not reduce the productive capacity of the soil. Alfalfa and grass forage in the cropping system reduces erosion and provides nitrogen and improves tilth for the crops that follow in the rotation.

Yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. Absence of an estimated yield indicates that the soil is not suited to the crop or the crop is not commonly grown on the soil or that a given crop is not commonly irrigated.

The estimated yields were based mainly on the experience and records of farmers, conservationists, and extension agents. Results of field trials and demonstrations and available yield data from nearby counties were also considered.

The yields were estimated assuming that the latest soil and crop management practices were used. Hay and pasture yields were estimated for the most productive varieties of grasses and legumes suited to the climate

and the soil. A few farmers may be obtaining average yields higher than those shown in table 5.

The management needed to achieve the indicated yields of the various crops depends on the kind of soil and the crop. Such management provides drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate tillage practices, including time of tillage and seedbed preparation and tilling when soil moisture is favorable; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residues, barnyard manure, and green-manure crops; harvesting crops with the smallest possible loss; and timeliness of all fieldwork.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown; that good quality irrigation water is uniformly applied in proper amounts as needed; and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of the soils for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not included because the acreage of these crops is small. The local offices of the Soil Conservation Service and the Cooperative Extension Service can provide information about the management concerns and productivity of the soils for these crops.

Capability classes and subclasses

Capability classes and subclasses show, in a general way, the suitability of soils for most kinds of field crops. The soils are classed according to their limitations when they are used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops that require special management. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for forest trees, or for engineering purposes.

In the capability system, all kinds of soil are grouped at three levels: capability class, subclass, and unit. These levels are defined in the following paragraphs (*11*). A survey area may not have soils of all classes.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants, or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants, or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and landforms have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class; they are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The capability unit is identified in the description of each soil map unit in the section "Soil maps for detailed planning." Capability units are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-4 or IIIe-6.

Range

Frank E. Parrill, area range conservationist, Soil Conservation Service, helped prepare this section.

About 75 percent, or 365,000 acres, of the survey area is rangeland. The major source of farm income is raising livestock, including both cattle and sheep.

Most of the cattle ranches are cow-calf operations. Nearly all of the sheep-raising units market all lambs in the fall. The units—both cattle and sheep—vary in size from small herds on 80-acre farms to 600 breeding cows or several bands of sheep on 15,000-acre units.

Nearly all of the owners of larger livestock units also have permits to graze on Federal lands administered by the U. S. Forest Service and/or the Bureau of Land Management. On all of the units, the range forage is supplemented by irrigated pastures, native meadows, and small grain stubble. In winter the native forage is supplemented with alfalfa or native hay and protein concentrates. Creep feeding of calves to increase market weight is practiced on a few ranches.

The native vegetation in many parts of the survey area was seriously depleted by excessive use during the settlement of the San Luis Valley. Continued use has prevented any opportunity for range recovery or improvement. Much of the area that was once open grassland and lush meadow is now covered with brush, cactus, low-value grasses, and weeds. The amount of forage produced is today only a fraction of what it was in the past. It could be increased by using management and structural practices that are effective for specific kinds of soil and range sites.

On the valley floor, most of the soils are deep sandy loam, loam, or clay loam over sand, gravel, or cobbles. Irrigation causes seeps in some places or there is a high water table, or soils are affected by accumulations of salt and alkali. These soils support a mixture of salt- and water-tolerant plants that have a high production potential. Sloping soils on terraces and fans surrounding the valley floor are mostly loam, sandy loam, and gravelly loam over bedrock or sand and gravel at shallow depths. Potential productivity of these soils is low because of the shallow rooting depth and a lack of moisture storage capacity. Foothill and mountain soils are mostly loam or stony loam, and many are shallow over bedrock.

Where climate and topography are about the same, differences in the kind and amount of vegetation that rangeland can produce are related closely to the kind of soil. Effective management is based on the relationships among soils, vegetation, and water.

Table 6 shows, for each kind of soil, the name of the range site; the total annual production of vegetation in favorable, normal, and unfavorable years; the characteristic vegetation; and the expected percentage of each species in the composition of the potential natural plant community. Soils not listed cannot support a natural plant community of predominately grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. The following are explanations of column headings in table 6.

A *range site* is a distinctive kind of rangeland that differs from other kinds of rangeland in its ability to produce a characteristic natural plant community. Soils that produce a similar kind, amount, and proportion of range plants are grouped into range sites. For those areas where the relationship between soils and vegetation has been established, range sites can be interpreted directly from the soil map. Properties that determine the capacity of the soil to supply moisture and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal high water table are also important.

Potential production refers to the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant community. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year the amount and distribution of precipitation and the temperatures are such that growing conditions are substantially better than average; in a normal year these conditions are about average for the area; in an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Dry weight refers to the total air-dry vegetation produced per acre each year by the potential natural plant community. Vegetation that is highly palatable to livestock and vegetation that is unpalatable are included. Some of the vegetation can also be grazed extensively by wildlife.

Characteristic species of grasses, grasslike plants, forbs, and shrubs that make up most of the potential natural plant community on each soil are listed by common name (*6, 7*). Under *Composition*, the expected proportion of each species is presented as the percentage, in air-dry weight, of the total annual production of herbaceous and woody plants. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season. Generally all of the vegetation produced is not used.

Range management requires, in addition to knowledge of the kinds of soil and the potential natural plant community, an evaluation of the present condition of the range vegetation in relation to its potential. Range condition is determined by comparing the present plant community with the potential natural plant community on a particular range site. The more closely the existing community resembles the potential community, the better the range condition. The objective in range management is to control grazing so that the plants growing on a site are about the same in kind and amount as the potential natural plant community for that site. Such management generally results in the maximum production of vegetation, conservation of water, and control of erosion. Sometimes, however, a range condition somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

Woodland management and productivity

Robert L. Irvine, district forester, Colorado State Forest Service, and Sherman J. Finch, woodland conservationist, Soil Conservation Service, helped prepare this section.

About 12 percent of the survey area is woodland. The major forest types are ponderosa pine, mixed conifer, and cottonwood. Scattered stands of the pinyon-juniper forest occur on the foothills.

The first major forest product was the hand-hewn railroad ties cut beginning about 1880. Logs for dwellings were harvested primarily from 1890 to 1900. Lumber production reached its peak in the 1930's. The forests are still productive under careful management. Pinyon is used for firewood and juniper for fence posts.

Table 7 contains information useful to woodland owners or forest managers planning use of the soils for wood crops. Only those soils suitable for wood crops are listed, and the ordination (woodland suitability) symbol for each soil is given. All soils bearing the same ordination symbol require the same general kinds of woodland management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; 5, low; and 6, very low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *t*, toxic substances in the soil; *d*, restricted root depth; *c*, clay in the upper part of the soil; *s*, sandy texture; *f*, high content of coarse fragments in the soil profile; and *r*, steep slopes. The letter *o* indicates insignificant limitations or restrictions. If a soil has more than one limitation, priority in placing the soil into a limitation class is in the following order: x, w, t, d, c, s, f, and r.

In table 7 the soils are also rated for a number of factors to be considered in management. *Slight, moderate,* and *severe* are used to indicate the degree of major soil limitations.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if some measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or equipment; *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree that the soil affects expected mortality of planted tree seedlings. Plant competition is not considered in the ratings. Seedlings from good planting stock that are properly planted during a period of sufficient rainfall are rated. A rating of *slight* indicates that the expected mortality of the planted seedlings is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Considered in the ratings of *windthrow hazard* are characteristics of the soil that affect the development of tree roots and the ability of the soil to hold trees firmly. A rating of *slight* indicates that trees in wooded areas are not expected to be blown down by commonly occurring winds; *moderate*, that some trees are blown down during periods of excessive soil wetness and strong winds; and *severe*, that many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

Ratings of *plant competition* indicate the degree to which undesirable plants are expected to invade or grow if openings are made in the tree canopy. The invading plants compete with native plants or planted seedlings by impeding or preventing their growth. A rating of *slight* indicates little or no competition from other plants; *moderate* indicates that plant competition is expected to hinder the development of a fully stocked stand of desirable trees; *severe* means that plant competition is expected to prevent the establishment of a desirable stand unless the site is intensively prepared, weeded, or otherwise managed for the control of undesirable plants.

The *potential productivity* of merchantable or *important trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Important trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

Woodland understory vegetation

Understory vegetation consists of grasses, forbs, shrubs, and other plants. Some types of forest, under proper management, can produce enough understory vegetation to support grazing of livestock or wildlife, or both.

The quantity and quality of understory vegetation vary with the kind of soil, the age and kind of trees, the density of the canopy, and the depth and condition of the forest litter. The density of the forest canopy affects the amount of light that understory plants receive during the growing season.

Table 6 shows the composition of understory vegetation on several soils in the survey area that support grazable forests. These soils are Aquic Ustorthents,

gravelly; Bushvalley very stony loam; Quamon-LaJara complex; Seitz very stony loam; and Shawa loam, wet. They support understory vegetation similar to the native range vegetation on other soils in the area.

The total production of understory vegetation is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year the soil moisture is above average during the optimum part of the growing season; in a normal year soil moisture is average; and in an unfavorable year it is below average.

Windbreaks and environmental plantings

Windbreaks are established to protect livestock, buildings, and yards from wind and snow. Windbreaks also help protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous species provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field, the interval depending on erodibility of the soil. They protect cropland and crops from wind, hold snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. A healthy planting stock of suitable species planted properly on a well prepared site and maintained in good condition can insure a high degree of plant survival.

Windbreaks and environmental plantings in the Conejos County Area require special care in site selection, planting, and maintenance. Supplemental irrigation is necessary in most cases to insure establishment and continued cultivation to reduce moisture stress to plantings.

Additional information about planning windbreaks and screens and the planting and care of trees can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from nurserymen.

Engineering

This section provides information about the use of soils for building sites, sanitary facilities, construction material, and water management. Among those who can benefit from this information are engineers, landowners, community planners, town and city managers, land developers, builders, contractors, and farmers and ranchers.

The ratings in the engineering tables are based on test data and estimated data in the "Soil properties" section. The ratings were determined jointly by soil scientists and engineers of the Soil Conservation Service using known relationships between the soil properties and the behavior of soils in various engineering uses.

Among the soil properties and site conditions identified by a soil survey and used in determining the ratings in this section were grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock that is within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure or aggregation, in-place soil density, and geologic origin of the soil material. Where pertinent, data about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of absorbed cations were also considered.

On the basis of information assembled about soil properties, ranges of values can be estimated for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, shear strength, compressibility, slope stability, and other factors of expected soil behavior in engineering uses. As appropriate, these values can be applied to each major horizon of each soil or to the entire profile.

These factors of soil behavior affect construction and maintenance of roads, airport runways, pipelines, foundations for small buildings, ponds and small dams, irrigation projects, drainage systems, sewage and refuse disposal systems, and other engineering works. The ranges of values can be used to (1) select potential residential, commercial, industrial, and recreational areas; (2) make preliminary estimates pertinent to construction in a particular area; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for location of sanitary landfills, onsite sewage disposal systems, and other waste disposal facilities; (5) plan detailed onsite investigations of soils and geology; (6) find sources of gravel, sand, clay, and topsoil; (7) plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; (8) relate performance of structures already built to the properties of the kinds of soil on which they are built so that performance of similar structures on the same or a similar soil in other locations can be predicted; and (9) predict the trafficability of soils for cross-country movement of vehicles and construction equipment.

Data presented in this section are useful for land-use planning and for choosing alternative practices or general designs that will overcome unfavorable soil properties and minimize soil-related failures. Limitations to the use of these data, however, should be well understood. First, the data are generally not presented for soil material below a depth of 5 or 6 feet. Also, because of the scale of the detailed map in this soil survey, small areas of soils that differ from the dominant soil may be included in mapping. Thus, these data do not eliminate the need for onsite investigations, testing, and analysis by personnel having expertise in the specific use contemplated.

The information is presented mainly in tables. Table 8 shows, for each kind of soil, the degree and kind of limitations for building site development; table 9, for sanitary facilities; and table 11, for water management. Table 10 shows the suitability of each kind of soil as a source of construction materials.

The information in the tables, along with the soil map, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations and to construct interpretive maps for specific uses of land.

Some of the terms used in this soil survey have a special meaning in soil science. Many of these terms are defined in the Glossary.

Building site development

The degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, and local roads and streets are indicated in table 8. A *slight* limitation indicates that soil properties generally are favorable for the specified use; any limitation is minor and easily overcome. A *moderate* limitation indicates that soil properties and site features are unfavorable for the specified use, but the limitations can be overcome or minimized by special planning and design. A *severe* limitation indicates that one or more soil properties or site features are so unfavorable or difficult to overcome that a major increase in construction effort, special design, or intensive maintenance is required. For some soils rated severe, such costly measures may not be feasible.

Shallow excavations are made for pipelines, sewerlines, communications and power transmission lines, basements, open ditches, and cemeteries. Such digging or trenching is influenced by soil wetness caused by a seasonal high water table; the texture and consistence of soils; the tendency of soils to cave in or slough; and the presence of very firm, dense soil layers, bedrock, or large stones. In addition, excavations are affected by slope of the soil and the probability of flooding. Ratings do not apply to soil horizons below a depth of 6 feet unless otherwise noted.

In the soil series descriptions, the consistence of each soil horizon is given, and the presence of very firm or extremely firm horizons, usually difficult to excavate, is indicated.

Dwellings and *small commercial buildings* referred to in table 8 are built on undisturbed soil and have foundation loads of a dwelling no more than three stories high. Separate ratings are made for small commercial buildings without basements and for dwellings with and without basements. For such structures, soils should be sufficiently stable that cracking or subsidence of the structure from settling or shear failure of the foundation does not occur. These ratings were determined from estimates of the shear strength, compressibility, and shrink-swell potential of the soil. Soil texture, plasticity and in-place density, potential frost action, soil wetness, and depth to a seasonal high water table were also considered. Soil wetness and depth to a seasonal high water table indicate potential difficulty in providing adequate drainage for basements, lawns, and gardens. Depth to bedrock, slope, and large stones in or on the soil are also important considerations in the choice of sites for these structures and were considered in determining the ratings. Susceptibility to flooding is a serious hazard.

Local roads and streets referred to in table 8 have an all-weather surface that can carry light to medium traffic all year. They consist of a subgrade of the underlying soil material; a base of gravel, crushed rock fragments, or soil material stabilized with lime or cement; and a flexible or rigid surface, commonly asphalt or concrete. The roads are graded with soil material at hand, and most cuts and fills are less than 6 feet deep.

The load supporting capacity and the stability of the soil as well as the quantity and workability of fill material available are important in design and construction of roads and streets. The classifications of the soil and the soil texture, density, shrink-swell potential, and potential frost action are indicators of the traffic supporting capacity used in making the ratings. Soil wetness, flooding, slope, depth to hard rock or very compact layers, and content of large stones affect stability and ease of excavation.

Sanitary facilities

Favorable soil properties and site features are needed for proper functioning of septic tank absorption fields, sewage lagoons, and sanitary landfills. The nature of the soil is important in selecting sites for these facilities and in identifying limiting soil properties and site features to be considered in design and installation. Also, those soil properties that affect ease of excavation or installation of these facilities will be of interest to contractors and local officials. Table 9 shows the degree and kind of limitations of each soil for such uses and for use of the soil as daily cover for landfills. It is important to observe local ordinances and regulations.

If the degree of soil limitation is expressed as *slight*, soils are generally favorable for the specified use and limitations are minor and easily overcome; if *moderate*, soil properties or site features are unfavorable for the specified use, but limitations can be overcome by special planning and design; and, if *severe*, soil properties or site features are so unfavorable or difficult to overcome that major soil reclamation, special designs, or intensive maintenance is required. Soil suitability is rated by the terms *good, fair,* and *poor,* which mean about the same as the terms *slight*, *moderate*, and *severe.*

Septic tank absorption fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into the natural soil. Only the soil horizons between depths of 18 and 72 inches are evaluated for this use. The soil properties and site features considered

are those that affect the absorption of the effluent and those that affect the construction of the system.

Properties and features that affect absorption of the effluent are permeability, depth to seasonal high water table, depth to bedrock, and susceptibility to flooding. Stones, boulders, and shallowness to bedrock interfere with installation. Excessive slope can cause lateral seepage and surfacing of the effluent. Also, soil erosion and soil slippage are hazards if absorption fields are installed on sloping soils.

In some soils, loose sand and gravel or fractured bedrock is less than 4 feet below the tile lines. In these soils the absorption field does not adequately filter the effluent, and ground water in the area may be contaminated.

On many of the soils that have moderate or severe limitations for use as septic tank absorption fields, a system to lower the seasonal water table can be installed or the size of the absorption field can be increased so that performance is satisfactory.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons have a nearly level floor and cut slopes or embankments of compacted soil material. Aerobic lagoons generally are designed to hold sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water. Soils that are very high in content of organic matter and those that have cobbles, stones, or boulders are not suitable. Unless the soil has very slow permeability, contamination of ground water is a hazard where the seasonal high water table is above the level of the lagoon floor. In soils where the water table is seasonally high, seepage of ground water into the lagoon can seriously reduce the lagoon's capacity for liquid waste. Slope, depth to bedrock, and susceptibility to flooding also affect the suitability of sites for sewage lagoons or the cost of construction. Shear strength and permeability of compacted soil material affect the performance of embankments.

Sanitary landfill is a method of disposing of solid waste by placing refuse in successive layers either in excavated trenches or on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil material. Landfill areas are subject to heavy vehicular traffic. Risk of polluting ground water and trafficability affect the suitability of a soil for this use. The best soils have a loamy or silty texture, have moderate to slow permeability, are deep to a seasonal water table, and are not subject to flooding. Clayey soils are likely to be sticky and difficult to spread. Sandy or gravelly soils generally have rapid permeability, which might allow noxious liquids to contaminate ground water. Soil wetness can be a limitation, because operating heavy equipment on a wet soil is difficult. Seepage into the refuse increases the risk of pollution of ground water.

Ease of excavation affects the suitability of a soil for the trench-type of landfill. A suitable soil is deep to bedrock and free of large stones and boulders. If the seasonal water table is high, water will seep into trenches.

Unless otherwise stated, the limitations in table 9 apply only to the soil material within a depth of about 6 feet. If the trench is deeper, a limitation of slight or moderate may not be valid. Site investigation is needed before a site is selected.

Daily cover for landfill should be soil that is easy to excavate and spread over the compacted fill in wet and dry periods. Soils that are loamy or silty and free of stones or boulders are better than other soils. Clayey soils may be sticky and difficult to spread; sandy soils may be subject to soil blowing.

The soils selected for final cover of landfills should be suitable for growing plants. Of all the horizons, the A horizon in most soils has the best workability, more organic matter, and the best potential for growing plants. Thus, for either the area- or trench-type landfill, stockpiling material from the A horizon for use as the surface layer of the final cover is desirable.

If it is necessary to bring in soil material for daily or final cover, thickness of suitable soil material available and depth to a seasonal high water table in soils surrounding the sites should be evaluated. Other factors to be evaluated are those that affect reclamation of the borrow areas. These factors include slope, erodibility, and potential for plant growth.

Construction materials

The suitability of each soil as a source of roadfill, sand, gravel, and topsoil is indicated in table 10 by ratings of good, fair, or poor. The texture, thickness, and organic-matter content of each soil horizon are important factors in rating soils for use as construction material. Each soil is evaluated to the depth observed, generally about 6 feet.

Roadfill is soil material used in embankments for roads. Soils are evaluated as a source of roadfill for low embankments, which generally are less than 6 feet high and less exacting in design than high embankments. The ratings reflect the ease of excavating and working the material and the expected performance of the material where it has been compacted and adequately drained. The performance of soil after it is stabilized with lime or cement is not considered in the ratings, but information about some of the soil properties that influence such performance is given in the descriptions of the soil series.

The ratings apply to the soil material between the A horizon and a depth of 5 to 6 feet. It is assumed that soil horizons will be mixed during excavation and spreading. Many soils have horizons of contrasting suitability within their profile. The estimated engineering properties in table 14 provide specific information about the nature of

each horizon. This information can help determine the suitability of each horizon for roadfill.

Soils rated *good* are coarse grained. They have low shrink-swell potential, low frost action potential, and few cobbles and stones. They are at least moderately well drained and have slopes of 15 percent or less. Soils rated *fair* have a plasticity index of less than 15 and have other limiting features, such as moderate shrink-swell potential, moderately steep slopes, wetness, or many stones. If the thickness of suitable material is less than 3 feet, the entire soil is rated *poor*.

Sand and *gravel* are used in great quantities in many kinds of construction. The ratings in table 10 provide guidance as to where to look for probable sources and are based on the probability that soils in a given area contain sizable quantities of sand or gravel. A soil rated *good* or *fair* has a layer of suitable material at least 3 feet thick, the top of which is within a depth of 6 feet. Coarse fragments of soft bedrock material, such as shale and siltstone, are not considered to be sand and gravel. Fine-grained soils are not suitable sources of sand and gravel.

The ratings do not take into account depth to the water table or other factors that affect excavation of the material. Descriptions of grain size, kinds of minerals, reaction, and stratification are given in the soil series descriptions and in table 14.

Topsoil is used in areas where vegetation is to be established and maintained. Suitability is affected mainly by the ease of working and spreading the soil material in preparing a seedbed and by the ability of the soil material to support plantlife. Also considered is the damage that can result at the area from which the topsoil is taken.

The ease of excavation is influenced by the thickness of suitable material, wetness, slope, and amount of stones. The ability of the soil to support plantlife is determined by texture, structure, and the amount of soluble salts or toxic substances. Organic matter in the A1 or Ap horizon greatly increases the absorption and retention of moisture and nutrients. Therefore, the soil material from these horizons should be carefully preserved for later use.

Soils rated *good* have at least 16 inches of friable loamy material at their surface. They are free of stones and cobbles, are low in content of gravel, and have gentle slopes. They are low in soluble salts that can restrict plant growth. They are naturally fertile or respond well to fertilizer. They are not so wet that excavation is difficult during most of the year.

Soils rated *fair* are loose sandy soils or firm loamy or clayey soils in which the suitable material is only 8 to 16 inches thick or soils that have appreciable amounts of gravel, stones, or soluble salt.

Soils rated *poor* are very sandy soils or very firm clayey soils; soils that have suitable layers less than 8 inches thick; soils that have large amounts of gravel, stones, or soluble salt; steep soils; and poorly drained soils.

Although a rating of *good* is not based entirely on high content of organic matter, a surface horizon is generally preferred for topsoil because of its organic-matter content. This horizon is designated as A1 or Ap in the soil series descriptions. The absorption and retention of moisture and nutrients for plant growth are greatly increased by organic matter.

Water management

Many soil properties and site features that affect water management practices have been identified in this soil survey. In table 11 the degree of soil limitation and soil and site features that affect use are indicated for each kind of soil. This information is significant in planning, installing, and maintaining water control structures.

Soil and site limitations are expressed as slight, moderate, and severe. *Slight* means that the soil properties and site features are generally favorable for the specified use and that any limitation is minor and easily overcome. *Moderate* means that some soil properties or site features are unfavorable for the specified use but can be overcome or modified by special planning and design. *Severe* means that the soil properties and site features are so unfavorable and so difficult to correct or overcome that major soil reclamation, special design, or intensive maintenance is required.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have a low seepage potential, which is determined by permeability and the depth to fractured or permeable bedrock or other permeable material.

Embankments, dikes, and levees require soil material that is resistant to seepage, erosion, and piping and has favorable stability, shrink-swell potential, shear strength, and compaction characteristics. Large stones and organic matter in a soil downgrade the suitability of the soil for use in embankments, dikes, and levees.

Aquifer-fed excavated ponds are bodies of water made by excavating a pit or dugout into a ground-water aquifer. Excluded are ponds that are fed by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Ratings in table 11 are for ponds that are properly designed, located, and constructed. Soil properties and site features that affect aquifer-fed ponds are depth to a permanent water table, permeability of the aquifer, quality of the water, and ease of excavation.

Drainage of soil is affected by such soil properties as permeability; texture; depth to bedrock, hardpan, or other layers that affect the rate of water movement; depth to the water table; slope; stability of ditchbanks; susceptibility to flooding; salinity and alkalinity; and availability of outlets for drainage.

Irrigation is affected by such features as slope, susceptibility to flooding, hazards of water erosion and soil

blowing, texture, presence of salts and alkali, depth of root zone, rate of water intake at the surface, permeability of the soil below the surface layer, available water capacity, need for drainage, and depth to the water table.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to intercept runoff. They allow water to soak into the soil or flow slowly to an outlet. Features that affect suitability of a soil for terraces are uniformity and steepness of slope; depth to bedrock, hardpan, or other unfavorable material; large stones; permeability; ease of establishing vegetation; and resistance to water erosion, soil blowing, soil slipping, and piping.

Grassed waterways are constructed to channel runoff to outlets at a nonerosive velocity. Features that affect the use of soils for waterways are slope, permeability, erodibility, wetness, and suitability for permanent vegetation.

Recreation

The soils of the survey area are rated in table 12 according to limitations that affect their suitability for recreation uses. The ratings are based on such restrictive soil features as flooding, wetness, slope, and texture of the surface layer. Not considered in these ratings, but important in evaluating a site, are location and accessibility of the area, size and shape of the area and its scenic quality, the ability of the soil to support vegetation, access to water, potential water impoundment sites available, and either access to public sewerlines or capacity of the soil to absorb septic tank effluent. Soils subject to flooding are limited, in varying degree, for recreation use by the duration and intensity of flooding and the season when flooding occurs. Onsite assessment of height, duration, intensity, and frequency of flooding is essential in planning recreation facilities.

The degree of the limitation of the soils is expressed as slight, moderate, or severe. *Slight* means that the soil properties are generally favorable and that the limitations are minor and easily overcome. *Moderate* means that the limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 12 can be supplemented by information in other parts of this survey. Especially helpful are interpretations for septic tank absorption fields, given in table 9, and interpretations for dwellings without basements and for local roads and streets, given in table 8.

Camp areas require such site preparation as shaping and leveling for tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils for this use have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing camping sites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for use as picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that will increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones or boulders, is firm after rains, and is not dusty when dry. If shaping is required to obtain a uniform grade, the depth of the soil over bedrock or hardpan should be enough to allow necessary grading.

Paths and trails for walking, horseback riding, bicycling, and other uses should require little or no cutting and filling. The best soils for this use are those that are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once during the annual period of use. They should have moderate slopes and have few or no stones or boulders on the surface.

Wildlife habitat

Eldie W. Mustard, state biologist, Soil Conservation Service, helped prepare this section.

Soils directly affect the kind and amount of vegetation that is available to wildlife as food and cover, and they affect the construction of water impoundments. The kind and abundance of wildlife that populate an area depend largely on the amount and distribution of food, cover, and water. If any one of these elements is missing, is inadequate, or is inaccessible, wildlife either are scarce or do not inhabit the area.

A great diversity of habitat types support a broad range of wildlife species in the Conejos County Area. This diversity is created mainly by elevational differences, which extend from a semidesert regime at 7,600 feet to coniferous-covered mountain habitats near 10,000 feet. Also contributing to the diversity are the Rio Grande and Conejos Rivers, as well as irrigation canals, irrigation ditches, drainage ditches, and wells, including many artesian wells.

Where water is available for irrigation in the area, rangeland is, or was, often changed to cropland. This change in land use greatly affects the kinds of wildlife

present. Land that once supported rangeland wildlife may now support geese, waterfowl, and pheasant.

Important wildlife species in the area include elk, mule deer, pronghorn antelope, black bear, blue grouse, mourning dove, pheasant, ducks, geese, cottontail, snowshoe hare, black-tailed jackrabbit, and white-tailed jackrabbit. Some of the predators and furbearers in the area are red fox, gray fox, coyote, long-tailed weasel, badger, raccoon, striped skunk, bobcat, mountain lion, beaver, and muskrat. The prairie rattlesnake and other amphibians and reptiles are found here.

The numerous birds in the area include bald eagle, golden eagle, crow, raven, burrowing owl, great horned owl, several species of swallows, black-billed magpie, sandhill crane, meadowlark, American kestrel, peregrine falcon, loggerhead shrike, mountain plover, blue heron, and many others.

If the soils have the potential, wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by helping the natural establishment of desirable plants.

In table 13, the soils in the survey area are rated according to their potential to support the main kinds of wildlife habitat in the area. This information can be used in planning for parks, wildlife refuges, nature study areas, and other developments for wildlife; selecting areas that are suitable for wildlife; selecting soils that are suitable for creating, improving, or maintaining specific elements of wildlife habitat; and determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* means that the element of wildlife habitat or the kind of habitat is easily created, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected if the soil is used for the designated purpose. A rating of *fair* means that the element of wildlife habitat or kind of habitat can be created, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* means that limitations are severe for the designated element or kind of wildlife habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* means that restrictions for the element of wildlife habitat or kind of habitat are very severe and that unsatisfactory results can be expected. Wildlife habitat is impractical or even impossible to create, improve, or maintain on soils having such a rating.

The elements of wildlife habitat are briefly described in the following paragraphs.

Grain and seed crops are seed-producing annuals used by wildlife. The major soil properties that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are wheat, oats, barley, millet, field peas, and sunflowers.

Grasses and legumes are domestic perennial grasses and herbaceous legumes that are planted for wildlife food and cover. Major soil properties that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are wheatgrasses, ryegrass, smooth brome, orchardgrass, alfalfa, yellow sweetclover, and other clovers.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds, that provide food and cover for wildlife. Major soil properties that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples are sleepygrass, sunflower, beeplant, Indian ricegrass, foxtail barley, and swainsona. Common wild herbaceous plants on rangeland are sand dropseed, grama grasses, saltgrass, wheatgrasses, alkali sacaton, ring muhly, pricklypear, yucca, perennial forbs, and legumes.

Hardwood trees and the associated woody understory provide cover for wildlife and produce nuts or other fruit, buds, catkins, twigs, bark, or foliage that wildlife eat. Major soil properties that affect growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of native plants are chokeberry, honeysuckle, caragana, skunkbush sumac, golden willow, Russian-olive, and cottonwood.

Coniferous plants are cone-bearing trees, shrubs, or ground cover plants that furnish habitat or supply food in the form of browse, seeds, or fruitlike cones. Soil properties that have a major effect on the growth of coniferous plants are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, juniper, and various ornamental shrubs and trees.

Shrubs are bushy woody plants that produce fruit, buds, twigs, bark, or foliage used by wildlife or that provide cover and shade for some species of wildlife. Major soil properties that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and moisture. Examples of shrubs are mountainmahogany, bitterbrush, snowberry, big sagebrush, aromatic sumac, fourwing saltbush, greasewood, winterfat, and currants.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites, exclusive of submerged or floating aquatics. They produce food or cover for wildlife that use wetland as habitat. Major soil properties affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are

smartweed, wildiris, blue-joint reedgrass, rushes, sedges, reeds, saltgrass, and cattail.

Shallow water areas are bodies of water that have an average depth of less than 5 feet and that are useful to wildlife. They can be naturally wet areas, or they can be created by dams or levees or by water-control structures in marshes or streams. Major soil properties affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. The availability of a dependable water supply is important if water areas are to be developed. Examples of shallow water areas are muskrat marshes, waterfowl feeding areas, wildlife water developments, and beaver ponds.

The kinds of wildlife habitat are briefly described in the following paragraphs.

Openland habitat consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The kinds of wildlife attracted to these areas include robin, western bluebird, mourning dove, ring-necked pheasant, meadowlark, white-crowned sparrow, killdeer, cottontail rabbit, and red fox.

Woodland habitat consists of areas of hardwoods or conifers, or a mixture of both, and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include snowshoe hare, blue grouse, pine siskin, woodpeckers, raccoon, mule deer, elk, and black bear.

Wetland habitat consists of open, marshy or swampy, shallow water areas where water-tolerant plants grow. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, avocet, rails, kingfisher, muskrat, mink, and beaver.

Rangeland habitat consists of areas of wild herbaceous plants and shrubs. Wildlife attracted to rangeland include antelope, jackrabbit, cottontail, mule deer, coyote, prairie dog, marsh hawk, golden eagle, meadowlark, prairie rattlesnake, and burrowing owl.

Soil properties

Extensive data about soil properties are summarized on the following pages. The two main sources of these data are the many thousands of soil borings made during the course of the survey and the laboratory analyses of selected soil samples from typical profiles.

In making soil borings during field mapping, soil scientists can identify several important soil properties. They note the seasonal soil moisture condition or the presence of free water and its depth. For each horizon in the profile, they note the thickness and color of the soil material; the texture, or amount of clay, silt, sand, and gravel or other coarse fragments (*8*); the structure, or the natural pattern of cracks and pores in the undisturbed soil; and the consistence of the soil material in place under the existing soil moisture conditions. They record the depth of plant roots, determine the pH or reaction of the soil, and identify any free carbonates.

Samples of soil material are analyzed in the laboratory to verify the field estimates of soil properties and to determine all major properties of key soils, especially properties that cannot be estimated accurately by field observation. Laboratory analyses are not conducted for all soil series in the survey area, but laboratory data for many soil series not tested are available from nearby survey areas (*12*).

The available field and laboratory data are summarized in tables. The tables give the estimated range of engineering properties, the engineering classifications, and the physical and chemical properties of each major horizon of each soil in the survey area. They also present data about pertinent soil and water features, engineering test data, and data obtained from physical and chemical laboratory analyses of soils.

Engineering properties

Table 14 gives estimates of engineering properties and classifications for the major horizons of each soil in the survey area.

Most soils have, within the upper 5 or 6 feet, horizons of contrasting properties. Table 14 gives information for each of these contrasting horizons in a typical profile. *Depth* to the upper and lower boundaries of each horizon is indicated. More information about the range in depth and about other properties in each horizon is given for each soil series in the section "Soil series and morphology."

Texture is described in table 14 in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains gravel or other particles coarser than sand, an appropriate modifier is added, for example, "gravelly loam." Other texture terms are defined in the Glossary.

The two systems commonly used in classifying soils for engineering use are the Unified Soil Classification System (*13, 2*) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO) (*1*).

The *Unified* system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter, plasticity index, liquid limit, and organic-matter content. Soils are grouped into 15 classes—eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two

classes have a dual classification symbol, for example, CL-ML.

The *AASHTO* system classifies soils according to those properties that affect their use in highway construction and maintenance. In this system a mineral soil is classified in one of seven basic groups ranging from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines. At the other extreme, in group A-7, are fine-grained soils. Highly organic soils are classified in group A-8 on the basis of visual inspection.

When laboratory data are available, the A-1, A-2, and A-7 groups are further classified as follows: A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, and A-7-6. As an additional refinement, the desirability of soils as subgrade material can be indicated by a group index number. These numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The estimated AASHTO classification, without group index numbers, is given in table 14. Also in table 14 the percentage, by weight, of rock fragments more than 3 inches in diameter is estimated for each major horizon. These estimates are determined mainly by observing volume percentage in the field and then converting that, by formula, to weight percentage.

Percentage of the soil material less than 3 inches in diameter that passes each of four sieves (U.S. standard) is estimated for each major horizon. The estimates are based on tests of soils that were sampled in the survey area and in nearby areas and on field estimates from many borings made during the survey.

Liquid limit and *plasticity index* indicate the effect of water on the strength and consistence of soil. These indexes are used in both the Unified and AASHTO soil classification systems. They are also used as indicators in making general predictions of soil behavior. Ranges in liquid limit and plasticity index are estimated on the basis of test data from the survey area or from nearby areas and on observations of the many soil borings made during the survey.

The estimates are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterburg limits extend a marginal amount across classification boundaries (1 or 2 percent), the classification in the marginal zone is omitted.

Physical and chemical properties

Table 15 shows estimated values for several soil characteristics and features that affect behavior of soils in engineering uses. These estimates are given for each major horizon, at the depths indicated, in the typical pedon of each soil. The estimates are based on field observations and on test data for these and similar soils.

Permeability is estimated on the basis of known relationships among the soil characteristics observed in the field—particularly soil structure, porosity, and gradation or texture—that influence the downward movement of water in the soil. The estimates are for vertical water movement when the soil is saturated. Not considered in the estimates is lateral seepage or such transient soil features as plowpans and surface crusts. Permeability of the soil is an important factor to be considered in planning and designing drainage systems, in evaluating the potential of soils for septic tank systems and other waste disposal systems, and in many other aspects of land use and management.

Available water capacity is rated on the basis of soil characteristics that influence the ability of the soil to hold water and make it available to plants. Important characteristics are content of organic matter, soil texture, and soil structure. Shallow-rooted plants are not likely to use the available water from the deeper soil horizons. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design of irrigation systems. It is commonly expressed as inches of water per inch of soil.

Soil reaction is expressed as range in pH values. The range in pH of each major horizon is based on many field checks. For many soils, the values have been verified by laboratory analyses. Soil reaction is important in selecting the crops, ornamental plants, or other plants to be grown; in evaluating soil amendments for fertility and stabilization; and in evaluating the corrosivity of soils.

Salinity is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of the nonirrigated soils. The salinity of individual irrigated fields is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of individual fields can differ greatly from the value given in table 15. Salinity affects the suitability of a soil for crop production, its stability when used as a construction material, and its potential to corrode metal and concrete.

Shrink-swell potential depends mainly on the amount and kind of clay in the soil. Laboratory measurements of the swelling of undisturbed clods were made for many soils. For others the swelling was estimated on the basis of the kind and amount of clay in the soil and on measurements of similar soils. The size of the load and the magnitude of the change in soil moisture content also influence the swelling of soils. Shrinking and swelling of some soils can cause damage to building foundations, basement walls, roads, and other structures unless special designs are used. A high shrink-swell potential indicates that special design and added expense may be required if the planned use of the soil will not tolerate large volume changes.

Risk of corrosion pertains to potential soil-induced chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to soil moisture, particle-size distribution,

total acidity, and electrical conductivity of the soil material. The rate of corrosion of concrete is based mainly on the sulfate content, texture, and acidity of the soil. Protective measures for steel or more resistant concrete help to avoid or minimize damage resulting from the corrosion. Uncoated steel intersecting soil boundaries or soil horizons is more susceptible to corrosion than an installation that is entirely within one kind of soil or within one soil horizon.

Wind erodibility groups are made up of soils that have similar properties that affect their resistance to soil blowing if cultivated. The groups are used to predict the susceptibility of soil to blowing and the amount of soil lost as a result of blowing. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are extremely erodible, so vegetation is difficult to establish. They are generally not suitable for crops.

2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible, but crops can be grown if intensive measures to control soil blowing are used.

3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible, but crops can be grown if intensive measures to control soil blowing are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible, but crops can be grown if intensive measures to control soil blowing are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible, but crops can be grown if measures to control soil blowing are used.

5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible, but crops can be grown if measures to control soil blowing are used.

6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible, and crops can easily be grown.

7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible, and crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to soil blowing.

Soil and water features

Table 16 contains information helpful in planning land uses and engineering projects that are likely to be affected by soil and water features.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are placed in one of four groups on the basis of the intake of water after the soils have been wetted and have received precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist chiefly of deep, well drained to excessively drained sands or gravels. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils that have a layer that impedes the downward movement of water or soils that have moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clay soils that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding is the temporary covering of soil with water from overflowing streams, with runoff from adjacent slopes, and by tides. Water standing for short periods after rains or after snow melts is not considered flooding, nor is water in swamps and marshes. Flooding is rated in general terms that describe the frequency and duration of flooding and the time of year when flooding is most likely. The ratings are based on evidence in the soil profile of the effects of flooding, namely thin strata of gravel, sand, silt, or, in places, clay deposited by floodwater; irregular decrease in organic-matter content with increasing depth; and absence of distinctive soil horizons that form in soils of the area that are not subject to flooding. The ratings are also based on local information about floodwater levels in the area and the extent of flooding and on information that relates the position of each soil on the landscape to historic floods.

The generalized description of flood hazards is of value in land-use planning and provides a valid basis for land-use restrictions. The soil data are less specific, however, than those provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table is the highest level of a saturated zone more than 6 inches thick for a continuous period of more than 2 weeks during most years. The depth to a seasonal high water table applies to undrained soils. Estimates are based mainly on the relationship between grayish colors or mottles in the soil and the depth to free water observed in many borings made during the course of the soil survey. Indicated in table 16 are the depth to the seasonal high water table and the months of the year that the water table commonly is high. Only saturated zones above a depth of 5 or 6 feet are indicated.

Information about the seasonal high water table helps in assessing the need for specially designed foundations, the need for specific kinds of drainage systems, and the need for footing drains to insure dry basements. Such information is also needed to decide whether or not construction of basements is feasible and to determine how septic tank absorption fields and other underground installations will function. Also, a seasonal high water table affects ease of excavation.

Depth to bedrock is shown for all soils that are underlain by bedrock at a depth of 5 to 6 feet or less. For many soils, the limited depth to bedrock is a part of the definition of the soil series. The depths shown are based on measurements made in many soil borings and on other observations during the mapping of the soils. The kind of bedrock and its hardness as related to ease of excavation is also shown. Rippable bedrock can be excavated with a single-tooth ripping attachment on a 200-horsepower tractor, but hard bedrock generally requires blasting.

Cemented pans are hard subsurface layers, within a depth of 5 or 6 feet, that are strongly compacted (indurated). Such pans cause difficulty in excavation. The hardness of pans is similar to that of bedrock. A rippable pan can be excavated, but a hard pan generally requires blasting.

Potential frost action refers to the likelihood of damage to pavements and other structures by frost heaving and low soil strength after thawing. Frost action results from the movement of soil moisture into the freezing temperature zone in the soil, which causes ice lenses to form. Soil texture, temperature, moisture content, porosity, permeability, and content of organic matter are the most important soil properties that affect frost action. It is assumed that the soil is not covered by insulating vegetation or snow and is not artificially drained. Silty and clayey soils that have a high water table in winter are most susceptible to frost action. Well drained very gravelly or sandy soils are the least susceptible.

Soil series and morphology

In this section, each soil series recognized in the survey area is described in detail. Units classified in higher categories are also described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are discussed for each series. The soil is then compared to similar soils and to nearby soils of other series. Then a pedon, a small three-dimensional area of soil that is typical of the soil series in the survey area, is described. The detailed descriptions of each soil horizon follow standards in the Soil Survey Manual (*10*). Unless otherwise noted, colors described are for moist soil.

Following the pedon description is the range of important characteristics of the soil series in this survey area. Phases, or map units, of each soil series are described in the section "Soil maps for detailed planning."

Acacio series

The Acacio series consists of well drained soils that formed in alluvium weathered mainly from basalt or similar richly ferromagnesian rock on flood plains. Slopes are 0 to 1 percent. The mean annual precipitation is about 7 inches, and the mean annual air temperature is about 41 degrees F.

Acacio soils are near the Zinzer, San Arcacio, and McGinty soils. Zinzer soils have mollic epipedons and no B horizon. San Arcacio soils do not have a calcium sulfate accumulation and have sand and gravel at depths of 20 to 40 inches. McGinty soils do not have the strong calcium sulfate accumulation of Acacio soils.

Typical pedon of Acacio sandy loam in the SW1/4NW1/4 sec. 22, T. 36 N., R. 9 E.:

A1—0 to 4 inches; grayish brown (10YR 5/2) sandy loam, dark grayish brown (10YR 3/2) moist; moderate fine granular structure; slightly hard, very friable; moderately alkaline; clear smooth boundary.

B2t—4 to 11 inches; yellowish brown (10YR 5/4) clay loam, dark yellowish brown (10YR 3/4) moist; moderate medium subangular blocky structure parting to moderate medium granular; hard, friable; very thin patchy clay films on peds; calcareous; moderately alkaline; clear smooth boundary.

B3ca—11 to 14 inches; brown (10YR 5/3) loam, dark brown (10YR 4/3) moist; a few fine faint yellowish brown (10YR 5/6) mottles in lower part; weak medium subangular blocky structure; hard, friable; calcareous with visible carbonates and small salt spots common; moderately alkaline; clear smooth boundary.

C1cacs—14 to 26 inches; very pale brown (10YR 7/3) loam, pale brown (10YR 6/3) moist; massive; slightly hard, very friable; calcareous with visible lime and gypsum crystals; moderately alkaline; clear smooth boundary.

C2cs—26 to 60 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; massive; slightly hard, friable; calcareous with about 30 percent gypsum in seams and pockets; moderately alkaline.

Thickness of the solum ranges from 11 to 20 inches, and there is no bedrock or strongly contrasting substratum above 40 inches. Depth to calcareous material ranges from 0 to 8 inches.

The B2t material has a weak prismatic to subangular blocky structure, but structure may vary in both grade and class. It is sandy clay loam or clay loam. The C horizon is typically loam or fine sandy loam with gypsum content ranging from 6 to 30 percent.

Alamosa series

The Alamosa series consists of deep, poorly drained soils formed in mixed alluvium on flood plains and alluvial terraces. Slopes are 0 to 1 percent. The mean annual precipitation is about 7 inches, and the mean annual air temperature is 41 degrees F.

Alamosa soils are near the LaJara, Nortonville, and Vastine soils. LaJara soils have sandy loam textures and no clay loam B horizon. Nortonville soils are more saline than Alamosa soils and have calcium sulfate accumulations. Vastine soils have no clay loam B horizon.

Typical pedon of Alamosa loam, 150 feet south and 1,050 feet east of the northwest corner of sec. 20, T. 36 N., R. 11 E.:

A1—0 to 6 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak coarse subangular blocky parting to moderate fine granular structure; hard, friable; few fine salt spots; moderately alkaline; abrupt smooth boundary.

B21tg—6 to 16 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; few fine distinct yellowish brown (10YR 6/6) and black (10YR 2/1) mottles; moderate coarse prismatic parting to moderate medium subangular blocky structure; hard, friable; thin patchy clay films on peds; few fine salt spots; moderately alkaline; clear smooth boundary.

B22tg—16 to 38 inches; pale brown (10YR 6/3) clay loam, dark grayish brown (10YR 4/3) moist; common fine distinct yellowish brown (10YR 5/6) and black (10YR 2/1) mottles; moderate medium prismatic parting to moderate medium subangular blocky structure; very hard, firm; very thin patchy clay films on peds; moderately alkaline; clear smooth boundary.

IICcag—38 to 60 inches; yellowish brown (10YR 5/4) loamy sand and sand, dark yellowish brown (10YR 3/4) moist; common medium distinct dark gray (10YR 4/1) mottles; single grained; loose when dry and moist; calcareous, fine spots and coatings of lime on gravel; moderately alkaline.

The solum ranges from 24 to 60 inches thick. Depth to continuous subhorizons of visible secondary calcium carbonate accumulation ranges from 15 to 50 inches. Rock fragments range from 0 to 15 percent in the solum and C horizon above a depth of 40 inches.

Aquents

The Aquents are deep, poorly drained soils formed in alluvium from mixed sources. The soils are on flood plains and low terraces. Slopes are 0 to 1 percent. The mean annual precipitation is about 7 inches, and the mean annual air temperature is about 41 degrees F.

The Aquents are near Aquolls and Aquic Ustorthents. Aquolls have a mollic epipedon. The Aquic Ustorthents have no mottles in the uppermost part of the pedon and are affected by a high water table for shorter periods in most years.

Reference profile for Aquents, in an area of Aquolls and Aquents, frequently flooded, about three-eighths mile west of the Rio Grande River and about one-eighth mile south of the Alamosa County line, in the NE1/4 sec. 21, T. 36 N., R. 11 E.:

A11—0 to 3 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; moderate fine granular structure; slightly hard, very friable; mildly alkaline; clear smooth boundary.

A12g—3 to 15 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; few medium distinct yellowish brown (10YR 5/6) moist mottles; weak medium subangular blocky structure parting to moderate fine granular; slightly hard, friable; mildly alkaline; gradual wavy boundary.

C1—15 to 26 inches; light brownish gray (10YR 6/2) fine sandy loam, grayish brown (10YR 5/2) moist; mottles are common medium distinct very dark gray (10YR 3/1) and yellowish brown (10YR 5/6) moist; massive; hard, friable; about 10 percent gravel; calcareous in spots; moderately alkaline; gradual wavy boundary.

C2—26 to 60 inches; light gray (10YR 7/2) gravelly sandy loam, grayish brown (10YR 5/2) moist; massive; hard, friable; about 25 percent gravel; calcareous; moderately alkaline.

The control section ranges from sandy loam to clay. The dark A11 horizon ranges from 1 to 6 inches thick. The C horizon in some pedons is stratified, and there is an irregular decrease in content of organic carbon. In some pedons, however, the C horizon is more uniform in texture and in content of organic carbon. A IIC horizon of sandy-skeletal material may be as shallow as 24 inches. The water table is generally 1 to 3 feet below the surface, and the soil is mottled from wetness above a depth of 18 inches in most pedons. Flooding is common in spring and early in summer when streams are high.

Aquic Ustorthents

The Aquic Ustorthents are deep, somewhat poorly drained soils that formed in mixed coarse alluvium. The soils are on nearly level flood plains and low terraces. Slopes are 0 to 1 percent. Mean annual precipitation is about 7 inches, and the mean annual air temperature is about 41 degrees F.

Aquic Ustorthents, which are along major streams, are near Aquolls and Aquents, which have a high water table for longer periods and are subject to more frequent flooding.

Reference profile for Aquic Ustorthents, gravelly, borders the Conejos River northwest of Mogote near the center of sec. 33, T. 33 N., R. 8 E.:

A1—0 to 8 inches; light brownish gray (10YR 6/2) gravelly sandy loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; soft, very friable; 20 percent gravel; neutral; clear wavy boundary.

C1—8 to 22 inches; very pale brown (10YR 7/3) gravelly sand, brown (10YR 5/3) moist; single grained; loose; 25 percent gravel; neutral; gradual wavy boundary.

C2g—22 to 60 inches; very pale brown (10YR 7/3) very gravelly sand, brown (10YR 5/3) moist; mottles are common medium distinct dark gray (10YR 4/1) and yellowish brown (10YR 5/6) moist; single grained; loose; 45 percent gravel; neutral.

The soil is frequently flooded for short periods in spring and early in summer. A water table ranges from 1 to 2 feet below the surface during the runoff season.

Reaction generally ranges from neutral to moderately alkaline in the A'1 and C horizons. Textures in the control section range from coarse-loamy (made up of 35 to 80 percent sand, 0 to 15 percent clay, and 5 to 50 percent silt) to sandy or sandy-skeletal (made up of 75 to 100 percent sand, 0 to 5 percent clay, and 0 to 25 percent silt). Content of rock fragment ranges from 25 to 45 percent, and an horizon within 40 inches of the surface contains more than 35 percent. Less than 5 percent of the fragments are greater than 3 inches in diameter. Some pedons contain thin strata of gravelly sandy loam in the control section. Mottling is common below depths of 20 inches in most pedons.

Aquolls

The Aquolls are deep, poorly drained soils that formed in alluvium from mixed sources. The soils are on flood plains and low terraces. Slopes are 0 to 1 percent. The mean annual precipitation is about 7 inches, and the mean annual air temperature is about 41 degrees F.

The Aquolls are near Aquents and Aquic Ustorthents, both of which have no mollic epipedon.

Reference profile for Aquolls in an area of Aquolls and Aquents, frequently flooded, about one-half mile west of the Rio Grande River and about one-eighth mile south of the Alamosa County line, in the NE1/4 sec. 21, T. 36 N., R. 11 E.:

O1—1 to 0 inches; undecomposed and partially decomposed grass, sedges, and roots.

A11—0 to 4 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; common fine faint yellowish brown (10YR 5/6) mottles; moderate fine granular structure; slightly hard, very friable; calcareous in small spots; moderately alkaline; clear wavy boundary.

A12g—4 to 10 inches; gray (10YR 5/1) light clay loam, very dark gray (10YR 3/1) moist; mottles are common medium distinct black (10YR 2/1) and yellowish brown (10YR 5/6) moist; moderate medium granular structure parting to moderate fine granular; slightly hard, friable; slightly sticky, slightly plastic; calcareous; moderately alkaline; clear wavy boundary.

B2g—10 to 26 inches; light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; mottles are common medium distinct black (10YR 2/1) and yellowish brown (10YR 5/6) moist; weak medium subangular blocky structure; hard, friable; calcareous in spots; moderately alkaline; clear wavy boundary.

IIC—26 to 60 inches; brown (10YR 5/3) gravelly loamy sand, dark brown (10YR 4/3) moist; mottles are common fine distinct black (10YR 2/1) and yellowish brown (10YR 5/6) moist; massive; hard, firm; 20 percent gravel; noncalcareous; moderately alkaline.

The control section ranges from sandy loam to clay loam. The A horizon ranges from neutral to moderately alkaline and is noncalcareous in some pedons. The B horizon ranges from a cambic horizon to an argillic horizon. The C horizon ranges from loamy sand to clay loam. The water table is generally 1/2 foot to 2 1/2 feet below the surface. Flooding is common in spring and early in summer when streams are high.

Arena series

The Arena series consists of moderately deep, poorly drained soils that formed in saline-alkali alluvium on flood plains and alluvial fans. Slopes are 0 to 1 percent. The mean annual precipitation is about 7 inches, and the mean air temperature is about 41 degrees F.

Arena soils are near the Corlett, Hooper, and Mosca soils. None has a duripan. Corlett soils are deep and sandy. Hooper soils have a clay loam B horizon and sand and gravel at a depth of 20 to 40 inches. Mosca soils have a sandy loam B horizon and sand and gravel at a depth of 20 to 40 inches.

Typical pedon of Arena loam about 1,320 feet south and 1,580 feet east of the northwest corner of sec. 26, T. 35 N., R. 10 E.:

A1—0 to 2 inches; light gray (10YR 7/2) loam, dark grayish brown (10YR 4/2) moist; weak thick platy parting to weak fine granular structure; very hard, firm; plastic, slightly sticky; many fine pores; calcareous; very strongly alkaline; clear smooth boundary.

AC—2 to 28 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; very weak medium subangular blocky structure; very hard, firm; a few brittle nodules; calcareous; very strongly alkaline; clear smooth boundary.

Csicam—30 to 60 inches; light brownish gray (10YR 6/2) strongly cemented duripan finely stratified with loamy sand, sandy loam, and sandy clay loam, dark grayish brown (10YR 4/2) moist; few fine faint yellowish brown (10YR 5/6) and dark gray (10YR 4/1) mottles; massive; and extremely hard and hard, very firm and friable; many concretions that soften only after alternate treatment with strong base and acid; visible secondary calcium carbonate and other salts in fine seams and spots; calcareous; very strongly alkaline; clear smooth boundary.

Depth to calcareous material ranges from 0 to about 6 inches. Depth to the duripan ranges from 20 to 40 inches. Hue generally ranges from 5Y to 7.5YR; in some pedons a few subhorizons having hue of 5YR or redder occur discontinuously but occupy less than half of the control section. A high water table occurs normally 1 to 2 feet below the surface during the growing season in most places, but may be as deep as 5 feet.

Bushvalley series

The Bushvalley series consists of shallow, well drained soils that formed in colluvium weathered primarily from rhyolite and tuff. Bushvalley soils are on mountainsides and ridges, mainly in open parks. Slopes are 2 to 40 percent. The mean annual precipitation is about 18 inches, and the mean annual air temperature is about 36 degrees F.

Bushvalley soils are near the Jerry, Seitz, and Youga soils. Jerry soils are deep over bedrock. Seitz soils are thicker over bedrock, are under coniferous forest, and have a very light-colored subsurface layer. Youga soils are more than 20 inches thick over bedrock and are less than 35 percent coarse fragments throughout the profile.

Typical pedon of Bushvalley very stony loam, 10 to 40 percent slopes, 350 feet south and 300 feet west of the northeast corner of sec. 32, T. 35 N., R. 6 E.:

A1—0 to 4 inches; brown (7.5YR 4/2) very stony loam, dark brown (7.5YR 3/2) moist; weak fine granular structure; slightly hard, very friable; about 40 percent angular stones and cobbles; slightly acid; clear smooth boundary.

B21t—4 to 6 inches; brown (7.5YR 4/2) very cobbly sandy clay loam, dark brown (7.5YR 3/2) moist; weak medium subangular blocky structure parting to moderate fine granular; hard, friable; few very thin patchy clay films on peds; about 55 percent angular cobbles; slightly acid; clear smooth boundary.

B22t—6 to 14 inches; brown (7.5YR 4/2) extremely cobbly heavy sandy clay loam, dark brown (7.5YR 3/2) moist; moderate medium subangular blocky structure parting to moderate fine subangular blocky; hard, friable; thin patchy clay films on peds and in pores; about 65 percent angular cobbles; neutral; clear smooth boundary.

B23t—14 to 17 inches; brown (7.5YR 5/4) extremely cobbly clay loam, dark brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; hard, friable; few thin patchy clay films on peds and in pores; about 65 percent angular cobbles; neutral; abrupt smooth boundary.

R—17 to 20 inches; hard unweathered rhyolite.

Depth to underlying bedrock ranges from 7 to 20 inches. Content of coarse fragments ranges from about 50 to more than 65 percent.

Corlett series

The Corlett series consists of deep, somewhat excessively drained, alkali soils that formed in wind-modified sandy alluvium from basalt and similar volcanic rock. Corlett soils are on low dunes and have slopes of 0 to 8 percent. The mean annual precipitation is about 7 inches, and the mean annual air temperature is about 41 degrees F.

Corlett soils are similar to the Space City soils. They are near the Arena, Hooper, and Mosca soils. Space City soils have horizons of secondary carbonate accumulation and less than 15 percent exchangeable sodium. Arena soils have a duripan. Hooper soils have a clay loam B horizon and have sand and gravel at a depth of 20 to 40 inches. Mosca soils have a sandy loam B2t horizon and have sand and gravel at a depth of 20 to 40 inches.

Typical pedon of Corlett loamy fine sand, in an area of Corlett-Hooper complex, undulating, is about 800 feet east and 100 feet south of the center of sec. 26, T. 35 N., R. 10 E.:

A1—0 to 8 inches; light brownish gray (10YR 6/2) loamy fine sand, dark brown (10YR 3/3) moist; weak medium granular structure; soft, very friable; calcareous; very strongly alkaline; gradual smooth boundary.

C—8 to 60 inches; pale brown (10YR 6/3) fine sand, dark brown (10YR 3/3) moist; many dark mineral grains; single grained; loose when dry and moist; calcareous; very strongly alkaline.

Exchangeable sodium ranges from 15 to 40 percent. Reaction is strongly alkaline or very strongly alkaline throughout the profile.

Cryaquolls

The Cryaquolls are deep, poorly drained soils that formed in alluvium from mixed sources. The soils are on valley bottoms and in swales. Slopes are 0 to 5 percent. The mean annual precipitation is about 20 inches, and the mean annual air temperature is about 35 degrees F.

The Cryaquolls are near Histosols, which are organic soils formed from decayed plants.

Reference profile for Cryaquolls, in an area of Cryaquolls and Histosols, flooded, northeast of cattle guard on road to La Jara Reservoir, or about 1,700 feet south and 1,600 feet west of the northeast corner of sec. 29, T. 35 N., R. 6 E.:

O1—3 inches to 0; partially decomposed grasses, sedges, forbs, and roots.

A1—0 to 7 inches; very dark gray (10YR 3/1) heavy clay loam, black (10YR 2/1) moist; mottles are few fine distinct yellowish brown (10YR 5/6) moist; weak medium subangular blocky structure parting to moderate medium and fine granular; hard, friable; sticky, plastic; neutral; clear smooth boundary.

B21tg—7 to 13 inches; grayish brown (10YR 5/2) sandy clay, very dark grayish brown (10YR 3/2) moist; mottles are common fine distinct yellowish brown (10YR 5/6) moist; moderate medium prismatic structure parting to moderate fine subangular blocky; very hard, friable; sticky, plastic; thin nearly continuous clay films on peds; about 10 percent fine gravel; neutral; clear smooth boundary.

B22tg—13 to 19 inches; dark grayish brown (10YR 4/2) gravelly clay, very dark grayish brown (10YR 3/2) moist; mottles are few medium distinct yellowish brown (10YR 5/4) moist; moderate medium subangular blocky structure parting to moderate fine granular; very hard, firm; sticky, plastic; thin nearly continuous clay films on peds and coating gravels; about 20 percent gravel; neutral; gradual wavy boundary.

B3—19 to 48 inches; pale brown (10YR 6/3) gravelly clay, dark brown (10YR 4/3) moist; mottles are common medium distinct, yellowish brown (10YR 5/6) and gray (5Y 5/1) moist; weak medium subangular blocky structure; very hard, firm; sticky, plastic; thin patchy clay films on peds and coating gravels; about 30 percent gravel; neutral; clear wavy boundary.

IICg—48 to 60 inches; light gray (10YR 7/1) gravelly loamy sand, dark gray (10YR 4/1) moist; mottles are many medium distinct, yellowish brown (10YR 5/4) and black (10YR 2/1) moist; massive; hard, friable; about 20 percent gravel; neutral.

The control section ranges from sandy loam to clay. Some pedons have argillic horizons; some have no argillic horizon but have a cambic horizon. The mollic epipedon ranges from about 10 to more than 20 inches thick. Water tables are usually within 1 1/2 feet of the surface. Flooding is common during snowmelt periods and in low areas near small lakes.

Cumbres series

The Cumbres series consists of moderately deep, well drained soils formed in material weathered from igneous rock. Cumbres soils are on foothill sides and ridges and have slopes of 1 to 9 percent. The mean annual precipitation is about 15 inches, and the mean annual air temperature is about 40 degrees F.

Cumbres soils are near the Luhon, Miracle, Stunner, and Travelers soils. Luhon and Stunner soils are more than 40 inches deep over bedrock. Miracle soils are fine-loamy in the control section and are less than 35 percent coarse fragments. Travelers soils are less than 20 inches deep over bedrock and are loamy, rather than clayey, in the fine earth fraction.

Typical pedon of Cumbres very stony loam, 1 to 9 percent slopes, 1,200 feet south and 950 feet east of the northwest corner of sec. 2, T. 33 N., R. 7 E.:

A1—0 to 4 inches; grayish brown (10YR 5/2) very stony loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; 40 percent angular rock fragments (primarily basalt); neutral; clear smooth boundary.

B21t—4 to 7 inches; brown (10YR 5/3) very stony heavy clay loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure parting to weak fine subangular blocky; slightly hard, very friable; 60 percent rock fragments; thin patchy clay films on peds; neutral; clear smooth boundary.

B22t—7 to 10 inches; brown (10YR 5/3) extremely stony heavy clay loam, dark brown (10YR 3/3) moist; weak to moderate medium subangular blocky structure; hard, friable; thin nearly continuous clay films on peds; 70 percent rock fragments; neutral; clear smooth boundary.

B3—10 to 16 inches; light yellowish brown (10YR 6/4) extremely stony clay loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure parting to moderate fine subangular blocky; hard, friable; thin patchy clay films on peds; 70 percent lime coated rocks; strongly calcareous, moderately alkaline; clear smooth boundary.

Cca—16 to 22 inches; light gray (10YR 7/2) extremely stony sandy loam, grayish brown (10YR 5/2) moist; massive; hard, firm; 70 percent lime coated rock fragments; very strongly calcareous with many lime concretions; moderately alkaline.

R—22 inches; fractured basalt.

Depth to bedrock ranges from 20 to 40 inches. Volume of rock fragments ranges from 20 to 40 percent in the A horizon and 30 to 75 percent in the B and C horizons. Depth to calcareous material normally ranges

from 7 to 24 inches. Thickness of the solum ranges from 8 to 24 inches. The A horizon has hue of 7.5YR or 10YR; value of 4 or 5 dry, 2 or 3 moist; and chroma of 1 through 3. The B2t horizon has hue of 7.5YR through 2.5Y; value of 4 through 6 dry, 3 or 4 moist; and chroma of 2 through 4. Clay content in the fine earth fraction ranges from 35 to 45 percent. The C horizon has hue of 7.5YR through 2.5Y.

Curecanti series

The Curecanti series consists of deep, well drained soils that formed in cobbly alluvium of igneous origin. Curecanti soils are on steep fans and high terraces in areas of foothills and mountains. Slopes are 5 to 25 percent. The mean annual precipitation is about 15 inches, and the mean annual air temperature is about 41 degrees F.

Curecanti soils are near the Empedrado and Miracle soils. Empedrado and Miracle soils are less than 35 percent coarse fragments. Miracle soils are shallow over bedrock.

Typical pedon of Curecanti very cobbly loam, in an area of Empedrado-Curecanti complex, 5 to 25 percent slopes, 1,036 feet south and 2,640 feet east of the northwest corner of sec. 19, T. 34 N., R. 7 E.:

A1—0 to 3 inches; grayish brown (10YR 5/2) very cobbly loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, very friable; about 40 percent cobbles and 15 percent gravel; neutral; clear wavy boundary.

B2t—3 to 14 inches; brown (7.5YR 5/2) very cobbly sandy clay loam, dark brown (7.5YR 3/2) moist; moderate fine subangular blocky structure parting to moderate fine granular; hard, firm; many thin patchy clay films on peds; about 40 percent cobbles and 20 percent gravel; neutral; clear wavy boundary.

B3—14 to 34 inches; pale brown (10YR 6/3) very cobbly sandy clay loam, dark brown (10YR 4/3) moist; moderate medium subangular blocky structure; very hard, firm; a few thin patchy clay films on peds and on undersides of cobbles; about 50 percent cobbles and 20 percent gravel; neutral; gradual wavy boundary.

C—34 to 60 inches; light brownish gray (10YR 6/2) very cobbly loamy sand, dark grayish brown (10YR 4/2) moist; single grained; loose dry and moist; about 70 percent cobbles and some gravel; neutral.

Depth to calcareous material ranges from 40 to more than 60 inches. Rock fragments range from 35 to 70 percent by volume in the major part of the solum and C horizon above a depth of 50 inches.

The A horizon has hue ranging from 2.5Y through 7.5YR; value of 4 or 5 dry, 2 or 3 moist; and chroma of 1 through 3. The B2t horizon has a hue of 2.5Y through 7.5YR; value of 4 through 7 dry, 2 through 6 moist; and chroma of 1 through 6. It is typically cobbly or very cobbly sandy clay loam or clay loam with 18 to 35 percent clay in the fine earth fraction. The C horizon has hue of 2.5Y through 7.5YR. It is typically very cobbly or extremely cobbly.

Derrick series

The Derrick series consists of deep, well drained soils that formed in very gravelly and cobbly alluvium over sand, gravel, and cobbles. Derrick soils are on alluvial fans and terraces. Slopes are 0 to 10 percent. The mean annual air temperature is about 41 degrees F, and the mean annual precipitation is about 7 inches.

Derrick soils are near the Graypoint, Dunul, and Platoro soils. Graypoint soils have finer textures and fewer cobbles in the upper part of the soil profile. Dunul soils are gravelly sandy loam in the upper part of the profile. Platoro soils have a clay loam B2t horizon that is less than 35 percent coarse fragments.

Typical pedon of Derrick very cobbly sandy loam, 0 to 1 percent slopes, 150 feet south and 50 feet east of the northwest corner of sec. 31, T. 36 N., R. 8 E.:

A1—0 to 5 inches; pale brown (10YR 6/3) very cobbly sandy loam, dark brown (10YR 4/3) moist; weak fine granular structure; hard, very friable; about 20 percent gravel and 20 percent cobbles; mildly alkaline; clear wavy boundary.

B2t—5 to 12 inches; yellowish brown (10YR 5/4) very gravelly clay loam, dark yellowish brown (10YR 4/4) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, firm; very thin patchy clay films on peds; about 30 percent gravel and 20 percent cobbles; mildly alkaline; clear wavy boundary.

C1ca—12 to 17 inches; light brownish gray (10YR 6/2) very cobbly sandy loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, friable; about 30 percent gravel and 40 percent cobbles; visible secondary calcium carbonate occurring in thin seams and as coatings on undersides of cobbles; calcareous; moderately alkaline; clear wavy boundary.

IIC2—17 to 60 inches; very gravelly sand; massive; soft, very friable; calcareous with thin coatings of calcium carbonate on undersides of coarse fragments in upper part of the horizon; moderately alkaline.

Depth to calcareous material ranges from 6 to 20 inches. Depth to unconformable sand and gravel ranges from 11 to 20 inches. Content of rock fragments ranges from 35 percent to about 70 percent in the solum.

Dunul series

The Dunul series consists of deep, somewhat excessively drained soils that formed in very gravelly alluvium. Dunul soils are on alluvial fans and terraces. Slopes are

0 to 6 percent. The mean annual precipitation is about 7 inches, and the mean annual air temperature is about 41 degrees F.

Dunul soils are near the Derrick, Graypoint, Lamanga, Platoro, Garita, and Shawa soils. Derrick soils have a B2t horizon. Graypoint soils have a gravelly sandy clay loam B2t horizon. Lamanga soils have no gravel and are mottled. Platoro soils have a clay loam B2t horizon and are 20 to 40 inches thick over sand and gravel. Garita soils have a concentrated zone of calcium carbonate accumulation. Shawa soils have a fine-loamy control section that is less than 35 percent coarse fragments.

Typical pedon of Dunul gravelly sandy loam about 600 feet south and 50 feet east of the northwest corner of sec. 10, T. 35 N., R. 8 E.:

A1—0 to 7 inches; pale brown (10YR 6/3) gravelly sandy loam, dark brown (10YR 4/3) moist; moderate coarse granular structure parting to moderate fine granular; soft, very friable; about 25 percent gravel and 5 percent cobbles; mildly alkaline; clear smooth boundary.

C—7 to 60 inches; pale brown (10YR 6/3) very cobbly loamy sand and very cobbly sand, dark brown (10YR 4/3) moist; single grained; loose; about 40 percent gravel and 30 percent cobbles, a few lime coatings on the underside of gravel in places; calcareous; mildly alkaline.

Depth to calcareous material and depth to sand, gravel, and cobbles range from 4 to 10 inches. Rock fragments range from 35 to 75 percent.

Empedrado series

The Empedrado series consists of deep, well drained soils that formed in calcareous alluvium weathered from rhyolite and andesite. Empedrado soils are on upland hills and alluvial fans. Slopes are 2 to 20 percent. The mean annual precipitation is about 15 inches, and the mean annual air temperature is about 40 degrees F.

Empedrado soils are near the Curecanti and Stunner soils. Stunner soils have concentrated layers of calcium carbonate accumulation (calcic horizons). Curecanti soils are more than 35 percent gravel and cobbles throughout the solum and are noncalcareous above a depth of 40 inches.

Typical pedon of Empedrado loam in an area of Empedrado-Curecanti complex, 5 to 25 percent slopes, about 25 feet north of trail and 50 feet east of the Carson National Forest boundary in the NE1/4SW1/4 sec. 7, T. 36 N., R. 7 E.:

A1—0 to 4 inches; brown (7.5YR 4/2) loam, dark brown (7.5YR 3/2) moist; moderate fine granular structure; soft, very friable; mildly alkaline; clear smooth boundary.

B21t—4 to 8 inches; brown (7.5YR 5/2) sandy clay loam, dark brown (7.5YR 3/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable; few very thin patchy clay films on peds; mildly alkaline; clear smooth boundary.

B22t—8 to 13 inches; brown (7.5YR 5/4) sandy clay loam, dark brown (7.5YR 4/4) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable; thin nearly continuous clay films on peds; mildly alkaline; clear smooth boundary.

B3t—13 to 22 inches; pinkish gray (7.5YR 6/2) sandy clay loam, brown (7.5YR 4/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, friable; few thin patchy clay films on peds; mildly alkaline; clear smooth boundary.

C1ca—22 to 40 inches; very pale brown (10YR 7/3) loam, brown (10YR 5/3) moist; massive; very hard, friable; calcareous with lime concretions and lime in seams and streaks; moderately alkaline; abrupt smooth boundary.

C2ca—40 to 60 inches; light yellowish brown (2.5Y 6/4) sandy loam, olive brown (2.5Y 4/4) moist; massive; extremely hard, firm; calcium carbonate visible in seams and streaks; calcareous, moderately alkaline.

Solum thickness and depth to calcium carbonate ranges from 20 to 50 inches. Content of rock fragments above a depth of 40 inches ranges from 0 to 15 percent. The fragments are predominately one-quarter inch to 3 inches in diameter.

Garita series

The Garita series consists of deep, well drained soils that formed in calcareous gravelly and cobbly alluvium. Garita soils are on sloping alluvial fans. Slopes are 0 to 25 percent. The mean annual precipitation is about 7 inches, and the mean annual air temperature is about 41 degrees F.

Garita soils are similar to the McGinty soil and are near Dunul, Luhon, Monte, Ryan Park, and Travelers soils. Dunul soils do not have a calcic horizon. McGinty, Luhon, and Monte soils are less than 35 percent gravel and cobbles. Ryan Park soils are less than 35 percent coarse fragments. Travelers soils have basalt bedrock at depths of less than 20 inches.

Typical pedon of Garita cobbly loam, 3 to 25 percent slopes, about 2,300 feet south and 400 feet west of the northeast corner of sec. 1, T. 34 N., R. 8 E.:

A1—0 to 7 inches; light brownish gray (10YR 6/2) cobbly loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; soft, very friable; about 10 percent gravel and 20 percent cobbles, mostly

basalt; calcareous; moderately alkaline; clear smooth boundary.

C1ca—7 to 20 inches; very pale brown (10YR 7/3) very cobbly loam, brown (10YR 5/3) moist; very weak coarse subangular blocky structure parting to weak fine granular; slightly hard, friable; about 20 percent gravel and 40 percent cobbles, mostly basalt; calcareous with lime concretions and lime in seams and as coatings on rock fragments; calcareous; moderately alkaline; clear wavy boundary.

C2ca—20 to 60 inches; very pale brown (10YR 7/3) very cobbly loam, pale brown (10YR 6/3) moist; massive; very hard, firm; about 15 percent gravel and 50 percent cobbles, mostly basalt; calcareous with lime in seams and as coatings on rock fragments; calcareous; strongly alkaline.

Depth to calcareous material ranges from 0 to 5 inches, and depth to concentrated layers of calcium carbonate accumulation ranges from 5 to 40 inches. The control section averages 18 to 35 percent clay. Content of rock fragments in the control section ranges from 35 to 85 percent. Fragments are dominantly less than 10 inches in diameter. There are fewer gravel and cobbles in gently sloping areas than in steeper areas.

Graypoint series

The Graypoint series consists of deep, well drained soils that formed in moderately fine alluvium that is shallow over sand and gravel. Graypoint soils are on nearly level to moderately sloping alluvial fans. Slopes are 0 to 9 percent. The mean annual precipitation is about 7 inches, and the mean annual air temperature is about 41 degrees F.

Graypoint soils are similar to the San Arcacio soils and are near the Derrick, Dunul, San Arcacio, and Platoro soils. Derrick and Dunul soils are more than 35 percent gravel and cobbles throughout. San Arcacio and Platoro soils are more than 20 inches deep over sand and gravel layers, and San Arcacio soils are only moderately well drained and have moderate salt accumulations.

Typical pedon of Graypoint gravelly sandy loam, 0 to 1 percent slopes, about 700 feet south and 850 feet west of the northeast corner of sec. 5, T. 33 N., R. 9 E.:

A1—0 to 5 inches; brown (10YR 5/3) gravelly sandy loam, dark brown (10YR 4/3) moist; weak fine granular structure; soft, very friable; about 20 percent gravel; moderately alkaline; clear wavy boundary.

B2t—5 to 14 inches; yellowish brown (10YR 5/4) gravelly sandy clay loam, dark yellowish brown (10YR 4/4) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, friable; thin nearly continuous clay films on peds and coating gravel; about 25 percent gravel; mildly alkaline; clear wavy boundary.

B3ca—14 to 18 inches; pale brown (10YR 6/3) very gravelly sandy loam, dark brown (10YR 4/3) moist; very weak medium subangular blocky structure; soft, very friable; about 35 percent gravel; calcareous with lime occurring as thin seams and coating underside of gravel; moderately alkaline; clear wavy boundary.

IIC—18 to 72 inches; light brownish gray (10YR 6/2) sand and gravel, mostly basalt, grayish brown (10YR 5/2) moist; single grained; loose when dry or moist; calcareous in spots; moderately alkaline.

Depth to uniformly calcareous material normally ranges from 6 to 20 inches. Depth to the sand and gravel layer ranges from 10 to 20 inches. Gravel content ranges from 10 to 35 percent in the major part of the profile and is dominantly one-quarter inch to 3 inches in diameter.

Histosols

The Histosols are deep, poorly drained peat and muck soils that formed from reeds and sedges in various stages of decomposition. Histosols are in nearly level swales and depressions. Slopes are 0 to 1 percent. Mean annual precipitation is about 20 inches, and the mean annual air temperature is about 35 degrees F. Histosols are near Cryaquolls, which are mineral soils.

Reference profile of Histosols in an area of Cryaquolls and Histosols, flooded, near the north end of La Jara Reservoir in the NW1/4NE1/4 sec. 13, T. 35 N., R. 5 E.:

Oa1—0 to 10 inches; sapric material, black (10YR 2/1) moist; no visible fibers; moderate medium granular structure; slightly acid; gradual wavy boundary.

Oa2—10 to 24 inches; sapric material, dark brown (10YR 3/3) moist; fibers evident in unrubbed sample, about 5 percent fibers evident when rubbed; massive; slightly acid; abrupt wavy boundary.

IICg—24 to 60 inches; gray (5Y 5/1) coarse sand, dark gray (5Y 4/1) moist; single grained; loose; about 10 percent gravel; slightly acid.

Material in the surface and subsurface tiers ranges from sapric to fibric, and is mainly from grasses, reeds, and sedges. Depth to the organic layers ranges from 16 to 60 inches or more. Water is at the surface or within 2 or 3 inches of the surface most of the time. Depth to bedrock is usually more than 5 feet, but a few areas are shallow over bedrock or fragmental material.

Hooper series

The Hooper series consists of deep, well drained alkali soils that formed in alluvium weathered principally from volcanic rocks. Hooper soils are on flood plains and have slopes of 0 to 1 percent. Mean annual precipitation

is about 7 inches, and the mean annual air temperature is about 41 degrees F.

Hooper soils are similar to Mosca soils. They are near the Arena, Corlett, and Mosca soils. Arena soils do not have a B horizon and have a duripan. Corlett soils are sandy throughout and do not have a B2t horizon. Mosca soils have a sandy loam B horizon.

Typical pedon of Hooper clay loam about 2,600 feet east and 2,550 feet south of the northwest corner of sec. 2, T. 35 N., R. 11 E.:

A2—0 to 3 inches; light gray (10YR 7/2) clay loam, brown (10YR 5/3) moist; weak coarse platy structure parting to moderate fine granular; hard, friable; calcareous; very strongly alkaline; abrupt smooth boundary.

B2t—3 to 13 inches; yellowish brown (10YR 5/4) heavy clay loam, dark yellowish brown (10YR 4/4) moist; moderate coarse prismatic structure parting to moderate medium subangular blocky; extremely hard, firm; calcareous; very strongly alkaline; clear smooth boundary.

B3casa—13 to 21 inches; very pale brown (10YR 7/4) heavy clay loam, light yellowish brown (10YR 6/4) moist; common distinct white (10YR 8/1) lime and salt spots, and a few coarse distinct brownish yellow (10YR 6/6) mottles; moderate coarse subangular blocky structure parting to moderate medium and fine subangular blocky; lime and salt visible as finely divided forms and crystals; calcareous; very strongly alkaline; gradual smooth boundary.

C1ca—21 to 26 inches; very pale brown (10YR 7/3) sandy clay loam, brown (10YR 4/3) moist; weak coarse subangular blocky structure parting to weak fine granular; hard, friable; calcareous; many fine spots of lime and salts; strongly alkaline; clear smooth boundary.

C2—26 to 37 inches; light gray (10YR 7/2) sandy clay loam, grayish brown (10YR 5/2) moist; massive; hard, friable; calcareous; strongly alkaline; abrupt smooth boundary.

IIC3—37 to 60 inches; sand and gravel; calcareous in some places; moderately alkaline.

Depth to sand and gravel ranges from 20 to 40 inches. Depth to water table ranges from 4 to more than 6 feet. Exchangeable sodium ranges from 15 to 60 percent in a majority of subhorizons, but is less than 15 percent in the A1 or A2 horizons in places.

Jerry series

The Jerry series consists of deep, well drained soils that formed in mixed alluvial outwash. Jerry soils are on mountainsides and valley-filling side slopes. Slopes are 3 to 25 percent. Mean annual precipitation is about 20 inches, and the mean annual air temperature is about 37 degrees F.

Jerry soils are near the Bushvalley, Youga, and Seitz soils. Bushvalley soils are less than 20 inches thick over bedrock. Youga soils have less clay in the control section than Jerry soils. Sietz soils are more than 35 percent stones throughout the profile and have a light-colored subsurface layer.

Typical pedon of Jerry loam, 3 to 25 percent slopes, about 250 feet east of the southwest corner of sec. 14, T. 35 N., R. 6 E.:

A11—0 to 6 inches; dark grayish brown (10YR 4/2) loam, black (10YR 2/1) moist; weak thick platy structure parting to moderate medium and fine granular; soft, very friable; about 5 percent gravel; neutral; clear smooth boundary.

A21—6 to 12 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak medium subangular blocky structure parting to moderate fine granular; slightly hard, friable; about 5 percent gravel; neutral; abrupt smooth boundary.

B1—12 to 18 inches; yellowish brown (10YR 5/4) clay loam, dark yellowish brown (10YR 3/4) moist; moderate medium subangular blocky structure; hard, friable; 5 percent cobbles and 5 percent gravel; neutral; clear smooth boundary.

B2t—18 to 28 inches; light brown (7.5YR 6/4) heavy clay loam, dark brown (7.5YR 4/4) moist; moderate medium subangular blocky structure parting to strong fine subangular blocky; very hard, firm; thin continuous clay films on peds; 15 percent cobbles and 5 percent gravel; neutral; clear smooth boundary.

B3ca—28 to 34 inches; light brown (7.5YR 6/4) cobbly clay loam, brown (7.5YR 5/4) moist; moderate, coarse and medium subangular blocky structure; very hard, firm; few thin patchy clay films on peds; about 20 percent small cobbles and 10 percent gravel; calcareous in a few small seams and pockets and on underside of some cobbles; neutral; clear smooth boundary.

Cca—34 to 60 inches; brown (10YR 5/3) cobbly clay, dark brown (10YR 3/3) moist; massive; extremely hard, very firm; about 20 percent cobbles and 10 percent gravel; calcareous in seams and thin streaks, with lime coating the underside of cobbles; moderately alkaline.

The solum ranges from 20 to 50 inches thick. Depth to secondary calcium carbonate accumulation ranges from 15 to 40 inches. The B2t horizon averages 35 to 50 percent clay. Content of rock fragments within 40 inches of the surface ranges from 0 to 35 percent. Fragments are dominantly less than 10 inches in diameter.

LaJara series

The LaJara series consists of deep, poorly drained soils that formed in alluvium derived principally from

basalt. LaJara soils are on flood plains and terraces. Slopes are 0 to 1 percent. Mean annual precipitation is about 7 inches, and the mean annual air temperature is about 41 degrees F.

LaJara soils are near the Alamosa, Lamanga, LaSauses, Mogote, Quamon, and Vastine soils. Alamosa soils have a finer solum than LaJara soils. Lamanga soils have a clay loam B2t horizon. LaSauses soils are more than 40 inches thick over sand and gravel and have a heavy clay loam or clay B horizon. Mogote soils have a fine-loamy control section. Quamon soils are gravelly throughout. Vastine soils have a finer solum and sand at depths of 20 to 40 inches.

Typical pedon of LaJara loam about 1,800 feet south and 560 feet east of the northwest corner of sec. 2, T. 33 N., R. 9 E.:

A11g—0 to 3 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; mottles are common small prominent yellowish red (5YR 4/6) moist; strong fine granular structure; soft, very friable; moderately alkaline; clear smooth boundary.

A12g—3 to 8 inches; gray (10YR 5/1) sandy loam, very dark grayish brown (10YR 3/2) moist; mottles are common small prominent yellowish red (5YR 4/6) moist; weak fine granular structure; slightly hard, very friable; calcareous; moderately alkaline; clear smooth boundary.

B2g—8 to 21 inches; light brownish gray (10YR 6/2) sandy loam, dark grayish brown (10YR 4/2) moist; mottles are many fine prominent yellowish red (5YR 4/6) moist; weak medium subangular blocky structure; hard, very friable; calcareous in spots; moderately alkaline; clear wavy boundary.

Cg—21 to 60 inches; variegated colors ranging from gray (5YR 6/1) moist to brown (7.5YR 5/4) moist stratified sandy loam, loamy sand, and sand; massive; soft, very friable; mildly alkaline.

Depth to calcareous material ranges from 0 to 6 inches. Percentage of exchangeable sodium ranges from 0 to 15 in most of the profile. Depth to unconformable very gravelly material ranges from 40 to more than 60 inches.

Lamanga series

The Lamanga series consists of deep, somewhat poorly drained soils that formed in mixed alluvium. Lamanga soils are on low terraces and flood plains. Slopes are 0 to 1 percent. Mean annual precipitation is about 7 inches, and the mean annual air temperature is about 41 degrees F.

Lamanga soils are near the Dunul, LaJara, and Mogote soils. Dunul soils are sandy and gravelly. LaJara soils have a sandy loam B horizon. Mogote soils have no B2t horizon.

Typical pedon of Lamanga sandy clay loam about 100 feet south and 1,400 feet east of the northwest corner of the SW1/4 sec. 11, T. 35 N., R. 8 E.:

Ap—0 to 6 inches; brown (7.5YR 5/4) sandy clay loam; dark brown (7.5YR 4/4) moist; weak medium subangular blocky structure; hard, friable; neutral; clear smooth boundary.

B2t—6 to 13 inches; brown (7.5YR 5/4) clay loam, dark brown (7.5YR 4/4) moist; some fine faint mottles of dark reddish brown (5YR 3/4) and gray (5YR 5/1) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; hard, friable; clay films on peds; slightly acid; clear smooth boundary.

B3g—13 to 19 inches; light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; fine faint mottles of dark reddish brown (5YR 3/4) and gray (5YR 5/1) moist; very weak medium subangular blocky structure; slightly hard, very friable; some large gravel; slightly acid; clear wavy boundary.

C—19 to 60 inches; brown (7.5YR 5/4) gravelly sandy loam, dark brown (7.5YR 3/4) moist; very weak medium subangular blocky structure; soft, very friable; some lime coatings on gravel; neutral.

Gravel content increases with depth and the C horizon contains as much as 35 percent gravel. The A horizon has hue of 7.5YR and 10YR; value of 5 through 6 dry, 4 or 5 moist; and chroma of 2 through 4. Texture is clay loam or sandy clay loam. The Bt horizon has hue of 7.5YR or 10YR; value of 5 through 6 dry, 4 or 5 moist; and chroma of 2 through 4. Texture is clay loam or sandy clay loam. Depth to seasonally high water table ranges from 1 1/2 to 3 feet during the irrigation season.

LaSauses series

The LaSauses series consists of deep, poorly drained soils that formed in mixed alluvium on nearly level flood plains. Slopes are 0 to 4 percent. Mean annual precipitation is about 7 inches, and the mean annual air temperature is about 41 degrees F.

LaSauses soils are similar to the Mishak soils. They are near the LaJara, Mogote, Nortonville, and Zinzer soils. Mishak soils have a medium to moderately fine textured control section that is less than 35 percent clay, and they are calcareous in the lower part of the profile. LaJara soils have coarse-loamy control sections. Mogote soils are less than 35 percent clay in the control section. Nortonville soils are loamy throughout, and have a layer of calcium sulfate accumulation. Zinzer soils are well drained and have a control section that is less than 35 percent clay.

Typical pedon of LaSauses sandy clay loam about 100 feet east and 950 feet south of the northwest corner of sec. 34, T. 36 N., R. 10 E.:

A11sa—0 to 4 inches; brownish yellow (10YR 6/6) sandy clay loam, dark yellowish brown (10YR 3/6) moist; weak fine granular structure; slightly hard, friable; thin salt crust on surface; a few cracks 3 cm across and 10 cm deep; calcareous; strongly alkaline; clear smooth boundary.

A12sa—4 to 16 inches; brownish yellow (10YR 6/6) heavy clay loam, dark yellowish brown (10YR 3/6) moist; mottles are few large faint brownish yellow (10YR 6/6) moist; weak fine granular structure; slightly hard, friable; visible salts in seams and spots; calcareous; very strongly alkaline; clear smooth boundary.

B2g—16 to 30 inches; very pale brown (10YR 7/4) heavy clay loam, dark yellowish brown (10YR 4/4) moist; many large distinct mottles of yellowish brown (10YR 5/8) and gray (N5) moist; massive; hard, firm; a few small salt seams; mildly alkaline; clear smooth boundary.

C1csg—30 to 52 inches; brownish yellow (10YR 6/6) stratified heavy clay loam and sandy clay loam, dark yellowish brown (10YR 4/6) moist; many large distinct mottles of reddish yellow (7.5YR 6/8), yellowish brown (10YR 5/6), and dark gray (N4) moist; massive; very hard, firm; visible gypsum crystals in seams and pockets; medium acid; abrupt smooth boundary.

IIC2g—52 to 60 inches; sand and gravel with mottles in upper part; neutral.

Typically this soil is calcareous in the surface layer and grades from alkaline to medium acid in the lower part of the control section.

Reaction in the A horizon ranges from strongly alkaline to very strongly alkaline, and exchangeable sodium ranges from 15 to 45 percent.

Luhon series

The Luhon series consists of deep, well drained soils that formed in mixed alluvium. Luhon soils are on alluvial fans and terraces. Slopes are 1 to 9 percent. Mean annual precipitation is about 10 inches, and the mean annual air temperature is about 41 degrees F.

Luhon soils are near the Cumbres, McGinty, Garita, Monte, Stunner, and Travelers soils. Cumbres soils have a B2t horizon and are more than 35 percent coarse fragments. McGinty soils are coarse-loamy. Garita soils are more than 35 percent gravel and cobbles throughout the profile. Monte soils have no concentrated zone of secondary calcium carbonate accumulation. Stunner soils have a clay loam B2t horizon. Travelers soils have bedrock at depths of less than 20 inches, and are more than 35 percent coarse fragments.

Typical pedon of Luhon loam, 3 to 9 percent slopes, in SE1/4SW1/4 sec. 1, T. 34 N., R. 7 E.:

A1—0 to 8 inches; pinkish gray (7.5YR 6/2) loam, dark brown (7.5YR 4/2) moist; moderate fine granular structure; soft, very friable; few pebbles and cobbles; calcareous; moderately alkaline; clear wavy boundary.

C1ca—8 to 20 inches; light yellowish brown (10YR 6/4) gravelly loam, dark yellowish brown (10YR 4/4) moist; massive; slightly hard, friable; 15 percent gravel and 5 percent cobbles; calcareous, with calcium carbonate visible as finely divided marl-like forms; moderately alkaline; clear wavy boundary.

C2ca—20 to 60 inches; pink (7.5YR 7/4) loam, brown (7.5YR 5/4) moist; massive; slightly hard, friable; 10 percent gravel and cobbles; calcareous; calcium carbonate visible in finely divided forms, but less than in the layer above; moderately alkaline.

Content of rock fragments ranges from 0 to 35 percent. Depth to calcareous material ranges from 0 to 5 inches. Depth to the calcic horizon ranges from 5 to 35 inches.

McGinty series

The McGinty series consists of deep, well drained and moderately well drained soils that formed in alluvium from basalt. McGinty soils are on flood plains and gently sloping alluvial fans. Slopes are 0 to 9 percent. Mean annual precipitation is about 7 inches, and the mean annual air temperature is about 41 degrees F.

McGinty soils are similar to the Garita soils. They are near the Acacio, Mosca, Luhon, Ryan Park, and Space City soils. Garita soils are more than 35 percent rock fragments and are more than 18 percent clay in the fine earth fraction. Acacio soils are fine-loamy and have a B2t horizon. Mosca soils have a B2t horizon and are high in exchangeable sodium. Luhon soils have a fine-loamy control section. Ryan Park soils have a B2t horizon. Space City soils do not have a calcic horizon.

Typical pedon of McGinty sandy loam, fan, 1 to 3 percent slopes, 200 feet west of the northeast corner of sec. 33, T. 35 N., R. 11 E.:

A1—0 to 2 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 3/3) moist; weak fine granular structure; soft, very friable; many dark magnetic mineral grains; a few pebbles; calcareous, mildly alkaline; clear smooth boundary.

AC—2 to 15 inches; light gray (10YR 7/2) sandy loam, brown (10YR 5/3) moist; massive; soft, very friable; many dark magnetic mineral grains; a few pebbles; calcareous; moderately alkaline; clear smooth boundary.

C1ca—15 to 32 inches; light gray (10YR 7/2) sandy loam, brown (10YR 5/3) moist; massive; slightly hard, friable; many dark magnetic mineral grains; a few pebbles; calcareous with much secondary calcium carbonate visible as concretions in thin seams

and streaks and as coatings on the sand and gravel fragments; moderately alkaline; abrupt smooth boundary.

C2ca—32 to 60 inches; light brownish gray (10YR 6/2) sandy loam, brown (10YR 5/3) moist; massive; slightly hard, friable; many dark magnetic mineral grains; a few gravel fragments; some accumulated secondary calcium carbonate but less than in the horizon above; calcareous; moderately alkaline.

The content of coarse fragments ranges from 10 to 20 percent. Depth to the calcic horizon ranges from 15 to 40 inches. Typically, these soils are calcareous at the surface, but they may be leached to a depth of a few inches in places. Exchangeable sodium is typically less than 1 percent in the upper part of the control section, but may increase with depth.

Miracle series

The Miracle series consists of moderately deep, well drained soils that formed in outwash material from igneous rock and the underlying Santa Fe Formation. Miracle soils are on ridges and mesas. Slopes are 3 to 9 percent. Mean annual precipitation is about 13 inches, and the mean annual air temperature is about 39 degrees F.

Miracle soils are similar to the Youga soils. They are near the Cumbres and Curecanti soils. Youga soils are deep. Cumbres soils have a very stony to extremely stony heavy clay loam B horizon. Curecanti soils are more than 35 percent cobbles and gravel throughout.

Typical pedon of Miracle loam, 3 to 9 percent slopes, about 1,500 feet east and 3,400 feet south of the northwest corner of sec. 18, T. 32 N., R. 8 E.:

A1—0 to 7 inches; dark brown (7.5YR 4/2) loam; very dark brown (7.5YR 2/2) moist; weak fine granular structure; soft, very friable; neutral; clear smooth boundary.

B1—7 to 13 inches; dark brown (7.5YR 4/2) sandy clay loam, very dark brown (7.5YR 2/2) moist; weak medium subangular blocky structure; slightly hard, firm; contains a few pebbles; mildly alkaline; clear wavy boundary.

B2t—13 to 22 inches; reddish brown (5YR 5/4) sandy clay loam, dark reddish brown (5YR 3/4) moist; moderate and strong medium subangular blocky structure; hard, firm; thin nearly continuous clay films on peds and on gravel; mildly alkaline; abrupt wavy boundary.

R—22 inches; hard conglomerate, with some of above soil material in seams and cracks.

Thickness of the mollic epipedon ranges from about 7 to 15 inches. The argillic horizon ranges from 9 to 24 inches thick and has a clay content of 18 to 35 percent. Depth to bedrock ranges from 20 to 40 inches.

Mishak series

The Mishak series consists of deep, somewhat poorly drained, saline soils that formed in calcareous alluvium from mixed sources. Mishak soils are on flood plains and alluvial terraces. Slopes are 0 to 1 percent. The mean annual precipitation is about 8 inches, and mean annual air temperature is about 41 degrees F.

Mishak soils are near the saline San Arcacio soils. San Arcacio soils have a sandy clay loam B horizon and have sand and gravel at 20- to 40-inch depths.

Typical pedon of Mishak loam about 1,200 feet east of the northwest corner of sec. 33, T. 35 N., R. 10 E.:

A11sa—0 to 7 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; weak medium platy structure parting to moderate fine granular; hard, friable; many small salt spots; calcareous; strongly alkaline; clear smooth boundary.

A12sag—7 to 16 inches; light yellowish brown (10YR 6/4) loam, dark yellowish brown (10YR 4/4) moist; common medium faint mottles of dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure parting to moderate fine granular; slightly hard, friable; many small salt spots; calcareous; strongly alkaline; clear smooth boundary.

C1ca—16 to 44 inches; light gray (10YR 7/2) loam, pale brown (10YR 6/3) moist; massive; very hard, friable; calcareous with visible secondary calcium carbonate coating gravel; strongly alkaline; gradual smooth boundary

C2cag—44 to 60 inches; light yellowish brown (10YR 6/4) sandy loam, dark yellowish brown (10YR 3/4) moist; many coarse distinct mottles of grayish brown (10YR 5/2) moist; massive; very hard, friable; visible secondary carbonate, but less than in the above horizon; calcareous; strongly alkaline.

Depth to calcareous material ranges from 0 to 10 inches. Seasonally high water table normally ranges from 1 to 2 feet below the surface during the summer months, but may be as deep as 4 1/2 feet in areas that have been drained.

Mogote series

The Mogote series consists of deep, somewhat poorly drained soils that formed in mixed alluvium with some influence from basaltic outwash. Mogote soils are on alluvial flood plains and terraces. Slopes are 0 to 1 percent. Mean annual precipitation is about 7 inches, and the mean annual air temperature is about 42 degrees F.

Mogote soils are near the LaJara, Lamanga, LaSauses, and Platoro soils. LaJara soils have a coarse-loamy control section. LaSauses soils have a heavy clay loam B horizon and are more than 40 inches thick over sand and gravel. Lamanga soils have a clay loam B

horizon and are less than 20 inches thick over a gravelly sandy loam C horizon. Platoro soils have a clay loam B horizon and are 20 to 40 inches thick over sand and gravel.

Typical pedon of Mogote loam about 100 feet south and 1,500 feet east of the northwest corner of sec. 20, T. 35 N., R. 9 E.:

Ap—0 to 8 inches; brown (10YR 5/3) loam, dark brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, friable; slightly calcareous; moderately alkaline; gradual wavy boundary.

C1csca—8 to 16 inches; pale brown (10YR 6/3) loam, dark brown (10YR 4/3) moist; massive; slightly hard, friable; 5 percent gypsum crystals; strongly calcareous; moderately alkaline; gradual wavy boundary.

C2ca—16 to 25 inches; light brown (7.5YR 6/4) loam, dark brown (7.5YR 4/4) moist; massive; slightly hard, friable; calcareous with visible secondary calcium carbonate and other salts occurring as concretions and in finely divided forms; moderately alkaline; gradual wavy boundary.

C3—25 to 37 inches; pinkish gray (7.5YR 6/2) loam, brown (7.5YR 5/3) moist; common medium distinct mottles are strong brown (7.5YR 5/5) moist; massive; calcareous in some spots; mildly alkaline; diffuse boundary.

C4g—37 to 45 inches; yellowish red (5YR 5/8) loam, yellowish red (5YR 4/8) moist; many medium prominent mottles of grayish brown (10YR 5/2), very dark grayish brown (10YR 3/2), and dark brown (7.5YR 4/4); massive; neutral; clear smooth boundary.

IIC5—45 to 60 inches; sand and gravel.

Depth to sand, or sand and gravel, ranges from 40 to 60 inches. Salinity is slight in the surface layer. Depth to water table fluctuates from about 2 feet to 3 1/2 feet, and the soil is mottled below a depth of about 20 inches. The A horizon has hue of 7.5YR or 10YR; value of 5 through 7 dry, 4 through 6 moist; and chroma of 2 through 4. The C horizon has hue of 5YR through 2.5Y.

Monte series

The Monte series consists of deep, well drained soils that formed in alluvium weathered principally from rhyolite or latite. Monte soils are on nearly level to gently sloping fans and flood plains. Slopes are 0 to 8 percent. Mean annual precipitation is about 7 inches, and the mean annual air temperature is about 41 degrees F.

Monte soils are similar to the Luhon soils. They are near the Luhon, Stunner, Garita, and Travelers soils. Luhon soils have concentrated layers of secondary calcium carbonate accumulation. Stunner soils have a clay loam B2t horizon and concentrated layers of calcium carbonate. Garita and Travelers soils have more than 35 percent rock fragments throughout the profile.

Typical pedon of Monte loam, 0 to 1 percent slopes, about 800 feet south and 1,200 feet east of the northwest corner of sec. 1, T. 32 N., R. 8 E.:

A1—0 to 4 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; weak thick platy structure parting to weak fine granular; slightly hard, very friable; calcareous; moderately alkaline; clear smooth boundary.

AC—4 to 9 inches; pale brown (10YR 6/3) loam, dark brown (10YR 3/3) moist; weak subangular blocky structure parting to moderate fine granular; slightly hard, friable; calcareous; moderately alkaline; clear smooth boundary.

C—9 to 60 inches; light yellowish brown (10YR 6/4) loam, dark yellowish brown (10YR 3/4) moist; massive; hard, friable; calcareous, moderately alkaline.

Mosca series

The Mosca series consists of deep, well drained alkali soils that formed in alluvium derived from basalt and similar richly ferromagnesian rocks. Mosca soils are on flood plains and fans. Slopes are 0 to 1 percent. Mean annual precipitation is about 7 inches, and the mean annual air temperature is about 41 degrees F.

Mosca soils are similar to the Hooper soils. They are near the Arena, Corlett, McGinty, Hooper, and San Arcacio soils. Hooper soils have a clay loam B horizon. Arena soils have a duripan and no B2t horizon. Corlett soils do not have a B2t horizon. McGinty soils have concentrated layers of calcium carbonate accumulation and no B2t horizon. San Arcacio soils have a sandy clay loam B2t horizon.

Typical pedon of Mosca loamy sand about 1,700 feet south and 350 feet west of the northeast corner of sec. 34, T. 35 N., R. 10 E.:

A1—0 to 2 inches; light brownish gray (10YR 6/2) loamy sand, dark brown (10YR 3/3) moist; single grained; loose when dry or moist; moderately alkaline; clear smooth boundary.

A2—2 to 3 inches; very pale brown (10YR 7/3) sandy loam, brown (10YR 4/3) moist; weak thin platy structure parting to fine granular; slightly hard, friable; calcareous; strongly alkaline; abrupt smooth boundary.

B2t—3 to 10 inches; light brown (7.5YR 6/4) sandy loam, brown (7.5YR 4/4) moist; moderate coarse prismatic structure parting to moderate medium subangular blocky; hard, friable; thin clay films on peds and coating sand grains; calcareous; very strongly alkaline; clear wavy boundary.

B3ca—10 to 19 inches; light yellowish brown (10YR 6/4) sandy loam, dark yellowish brown (10YR 4/4) moist; weak coarse subangular blocky structure; very hard, firm; a few very thin patchy clay films on peds; calcareous, with calcium carbonate visible as finely

divided forms; very strongly alkaline; clear smooth boundary.

C1ca—19 to 36 inches; very pale brown (10YR 7/3) sandy loam, brown (10YR 4/3) moist; massive; very hard, friable; calcareous, with calcium carbonate visible as finely divided forms; very strongly alkaline; clear wavy boundary.

IIC2—36 to 60 inches; sand and gravel.

Exchangeable sodium generally ranges from 15 to 50 percent in the B horizon but is less than 15 percent in the surface horizon of some pedons. Depth to the IIC horizon ranges from 20 to 40 inches.

Nortonville series

The Nortonville series consists of deep, poorly drained soils that formed in alluvium weathered primarily from volcanic rock. Nortonville soils are on flood plains and terraces. Slopes are 0 to 1 percent. Mean annual precipitation is about 7 inches, and the mean annual air temperature is about 41 degrees F.

Nortonville soils are near the LaSauses, Alamosa, and Vastine soils. LaSauses soils are more than 35 percent clay throughout. Alamosa and Vastine soils have no calcium sulfate accumulations. Vastine soils overlie sand or sand and gravel at a depth of 20 to 40 inches.

Typical pedon of Nortonville loam, about 150 feet south and 2,100 feet west of the northeast corner of sec. 20, T. 36 N., R. 11 E.:

A1cs—0 to 12 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak thin platy structure parting to moderate fine granular; slightly hard, friable; calcareous; many salt and gypsum spots; strongly alkaline; clear smooth boundary.

C1cs—12 to 28 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; weak coarse subangular blocky structure parting to weak fine granular; hard, friable; calcareous; many gypsum seams and spots; strongly alkaline; clear smooth boundary.

C2—28 to 42 inches; light yellowish brown (2.5Y 6/4) fine sandy loam, olive brown (2.5Y 4/4) moist; massive; hard, friable; moderately alkaline; clear smooth boundary.

C3—42 to 60 inches; light yellowish brown (2.5Y 6/4) gravelly sandy loam, olive brown (2.5Y 4/4) moist; massive; hard, friable; moderately alkaline.

The Nortonville soils are calcareous in the A and Ccs horizons but grade to noncalcareous at depths of less than 40 inches. Exchangeable sodium decreases with depth. Depth to horizons of calcium sulfate accumulation ranges from 8 to 24 inches. Depth to sand and gravel ranges from 40 to more than 60 inches. Seasonally high water table occurs at depths of 1 to 2 1/2 feet in spring and early in summer.

Occasional flooding occurs in some places for brief periods.

Platoro series

The Platoro series consists of deep, well drained soils that formed in alluvium derived principally from basalt. Platoro soils are on alluvial fans and terraces. Slopes are 0 to 1 percent. Mean annual precipitation is about 8 inches, and the mean annual air temperature is about 41 degrees F.

Platoro soils are near Graypoint, Derrick, and Mogote soils. Graypoint and Derrick soils are coarser in the A and B horizons than Platoro soils and are thinner over sand and gravel. Mogote soils are wet and do not have a B2t horizon.

Typical pedon of Platoro loam about 700 feet east and 100 feet south of the north quarter corner of sec. 17, T. 34 N., R. 9 E.:

Ap—0 to 7 inches; pale brown (10YR 6/3) loam, dark brown (10YR 4/3) moist; moderate fine granular structure; hard, friable; 10 percent gravel; calcareous; moderately alkaline; clear smooth boundary.

B2t—7 to 11 inches; brown (7.5YR 5/4) clay loam, dark brown (7.5YR 4/4) moist; weak medium subangular blocky structure; hard, friable; thin patchy clay films on peds and in root channels; 10 percent gravel, mostly basalt; many dark gray volcanic sand grains; calcareous; moderately alkaline; clear smooth boundary.

B3ca—11 to 18 inches; brown (7.5YR 5/4) gravelly clay loam, dark brown (7.5YR 4/4) moist; weak medium subangular blocky structure; hard, friable; thin patchy clay films on peds and discontinuous coatings in root channels; 15 percent gravel, mostly basalt; many dark sand grains; calcareous with secondary calcium carbonate visible as concretions and as coatings on gravel fragments; moderately alkaline; clear smooth boundary.

IIC1ca—18 to 24 inches; brown (10YR 5/3) very gravelly sandy loam, dark brown (10YR 4/3) moist; massive; hard, friable; 80 percent gravel, mostly basalt; many dark mineral sand grains; calcareous with secondary calcium carbonate occurring as concretions, as thin seams and streaks, and as coatings on the gravel fragments; moderately alkaline; clear smooth boundary.

IIC2ca—24 to 60 inches; sand and gravel.

Depth to the IIC horizon ranges from 20 to 40 inches. Thickness of the solum ranges from 10 to 36 inches. Depth to horizons of visible secondary calcium carbonate or sulfate accumulation ranges from 10 to 40 inches. Hue of the profile ranges from 5Y through 7.5YR, but in

some pedons a few discontinuous subhorizons are redder than 7.5YR.

Quamon series

The Quamon series consists of deep, moderately well drained soils that formed in alluvium derived principally from basalt. Quamon soils are on alluvial terraces. Slopes are 0 to 1 percent. Mean annual precipitation is about 7 inches, and the mean annual air temperature is about 41 degrees F.

Quamon soils are near LaJara soils. LaJara soils are mottled from wetness and are less than 15 percent gravel and cobbles.

Typical pedon of Quamon gravelly sandy loam in an area of Quamon-LaJara complex 2,300 feet south and 1,890 feet east of the northwest corner of sec. 36, T. 34 N., R. 9 E.:

Ap—0 to 5 inches; brown (10YR 5/3) gravelly sandy loam, dark brown (10YR 4/3) moist; moderate fine granular structure; soft, very friable; 30 percent gravel and cobbles; slightly calcareous; moderately alkaline; gradual smooth boundary.

C1—5 to 16 inches; brown (10YR 5/3) gravelly sandy loam, dark brown (10YR 4/3) moist; weak coarse subangular blocky structure parting to weak fine granular; soft, very friable; 25 percent gravel and 5 percent cobbles; slightly calcareous; moderately alkaline; gradual smooth boundary.

IIC2—16 to 60 inches; light yellowish brown (10YR 6/4) very gravelly sand, yellowish brown (10YR 5/4) moist; single grained; loose when dry or moist; 65 percent gravel and 10 percent cobbles; calcareous; moderately alkaline.

Coarse fragments are predominantly gravel and range from 15 to 30 percent in the A horizon and from 10 to 35 percent in the C1 horizon. Some areas have up to 10 percent cobbles. A water table fluctuates between depths of 36 to 60 inches.

Ryan Park series

The Ryan Park series consists of deep, well drained soils that formed in alluvium of mixed origin. Ryan Park soils are on gently sloping fans at the base of basalt hills and mesas. Slopes are 3 to 5 percent. Mean annual precipitation is about 7 inches, and the mean annual air temperature is about 41 degrees F.

Ryan Park soils are near the Garita, McGinty, and Space City soils. Garita soils are more than 35 percent coarse fragments throughout the profile and have a layer of concentrated calcium carbonate accumulation. McGinty soils have a layer of concentrated calcium carbonate accumulation. Space City soils do not have a B2t horizon.

Typical pedon of Ryan Park sandy loam, 3 to 5 percent slopes, about 1,160 feet north and 450 feet east of the center of sec. 13, T. 33 N., R. 10 E.:

A1—0 to 5 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 4/3) moist; massive; soft, very friable; mildly alkaline; clear smooth boundary.

B21t—5 to 15 inches; yellowish brown (10YR 5/4) sandy loam, dark yellowish brown (10YR 4/4) moist; moderate coarse subangular blocky structure; hard, friable; few very thin patchy clay films on peds; mildly alkaline; clear smooth boundary.

B22t—15 to 20 inches; yellowish brown (10YR 5/4) sandy loam, dark yellowish brown (10YR 4/4) moist; moderate coarse subangular blocky structure parting to moderate fine subangular blocky; very hard, firm; many thin patchy clay films on both horizontal and vertical faces of soil aggregates, clay coatings on sand grains and clay bridges between sand grains; mildly alkaline; abrupt smooth boundary.

B3ca—20 to 32 inches; pale brown (10YR 6/3) sandy loam, dark brown (10YR 4/3) moist; massive; very hard, firm; some clay bridgings between sand grains; calcareous with secondary calcium carbonate visible as concretions and in thin seams and streaks; moderately alkaline; clear smooth boundary.

Cca—32 to 60 inches; pale brown (10YR 6/3) loamy sand and sandy loam, dark brown (10YR 4/3) moist; massive; soft, very friable; calcareous with secondary calcium carbonate visible as concretions and in thin seams and streaks; content of visible secondary calcium carbonate decreases with depth; moderately alkaline.

The depth of calcareous material typically ranges from 10 to 30 inches. Thickness of the solum ranges from 10 to 30 inches. Content of coarse fragments ranges from 0 to 10 percent.

San Arcacio series

The San Arcacio series consists of deep, moderately well drained soils that formed in mixed alluvium. San Arcacio soils are on flood plains and terraces. Slopes are 0 to 1 percent. Mean annual precipitation is about 7 inches, and the mean annual air temperature is about 41 degrees F.

San Arcacio soils are similar to the Graypoint soils. They are near the Acacio, Mishak, Graypoint, Mosca, and Zinzer soils. Graypoint soils have a sandy-skeletal C horizon at depths of 10 to 20 inches. Acacio soils have concentrated layers of calcium sulfate. Mishak soils are more than 60 inches thick over sand and gravel, and have a layer of calcium carbonate accumulation and high salt concentration. Mosca soils have a sandy loam B2t horizon. Zinzer soils are more than 60 inches thick over sand and gravel.

Typical pedon of San Arcacio sandy loam about 1,500 feet west and 150 feet north of the southeast corner of sec. 36, T. 35 N., R. 9 E.:

Ap—0 to 8 inches; yellowish brown (10YR 5/4) sandy loam, dark brown (10YR 3/3) moist; moderate fine granular structure; slightly hard, very friable; mildly alkaline; clear smooth boundary.

B2t—8 to 15 inches; yellowish brown (10YR 5/4) sandy clay loam, dark yellowish brown (10YR 3/4) moist; moderate medium subangular blocky structure parting to moderate fine subangular blocky; hard, friable; thin patchy clay films on peds; moderately alkaline; clear smooth boundary.

C1ca—15 to 23 inches; light grayish brown (10YR 6/2) sandy clay loam, dark grayish brown (10YR 4/2) moist; massive; hard, friable; calcareous with calcium carbonate visible as finely divided forms; moderately alkaline; abrupt smooth boundary.

IIC2—23 to 60 inches; sand and gravel; noncalcareous except in upper few inches; moderately alkaline.

Depth to calcareous material ranges from 12 to 40 inches, thickness of the solum ranges from 10 to 40 inches, and depth to the gravel and sand IIC horizon ranges from 20 to 40 inches. The B2t horizon is sandy clay loam or clay loam. Depth to an irrigation-induced water table ranges from 36 to 48 inches, and sodium saturation is high in some pedons.

Seltz series

The Seltz series consists of deep, well drained soils that formed in slopewash derived principally from rhyolite, andesite, and trachite. Seltz soils are on mountainsides and ridges. Slopes are 10 to 65 percent. Mean annual precipitation is about 18 inches, and the mean annual air temperature is about 38 degrees F.

Seltz soils are near the Bushvalley, Jerry, and Youga soils. Bushvalley soils have bedrock within 20 inches of the surface. Jerry and Youga soils are less than 35 percent coarse fragments.

Typical pedon of Seltz very stony loam, 10 to 65 percent slopes, about 1,585 feet north and 1,320 feet east of the southwest corner of sec. 12, T. 34 N., R. 6 E.:

O—2 inches to 0; partially decomposed organic material (pine needles and twigs).

A1—0 to 2 inches; dark grayish brown (10YR 4/2) very stony loam, black (10YR 2/1) moist; weak medium and fine granular structure; soft, very friable; 40 percent stones; neutral; clear smooth boundary.

A2—2 to 12 inches; pinkish gray (7.5YR 6/2) very stony loam, brown (7.5YR 4/2) moist; weak to fine granular structure; soft, very friable; 40 percent stones; neutral; gradual wavy boundary.

A&B—12 to 17 inches; mixed pinkish gray (7.5YR 6/2) and brown (7.5YR 5/2) very stony clay loam, brown (7.5YR 4/2) moist; moderate medium subangular blocky structure; slightly hard, friable; this horizon consists of clayey material like that of the underlying horizon embedded in a light-colored matrix like that of the overlying horizon; 40 percent stones; slightly acid; gradual wavy boundary.

B2t—17 to 26 inches; light brown (7.5YR 6/4) very stony clay, dark brown (7.5YR 4/4) moist; strong medium subangular blocky structure; hard, friable; thin continuous clay films on peds and in root channels; 40 percent stones; slightly acid; clear wavy boundary.

B3t—26 to 30 inches; light brown (7.5YR 6/4) very stony heavy clay loam, dark brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; hard, friable; thin patchy clay films on peds and discontinuous coatings in root channels; 60 percent stones; slightly acid; clear wavy boundary.

C—30 to 60 inches; brown (7.5YR 5/4) very stony clay loam, dark brown (7.5YR 4/4) moist; massive; very hard, friable; 60 percent stones; slightly acid.

These soils have a very stony heavy clay loam or clay B2t horizon. Depth to calcareous material ranges from 40 to 60 inches. A transitional A&B horizon, more than 3 inches thick, occurs between the A2 and B2t horizons. Rock fragments are predominantly more than 10 inches in diameter.

Shawa series

The Shawa series consists of deep, well drained or moderately well drained soils that formed in alluvium derived primarily from latite, rhyolite, and breccia (fig. 15). Shawa soils are on alluvial fans and terraces. Slopes are 0 to 5 percent. Mean annual precipitation is about 14 inches, and the mean annual air temperature is about 41 degrees F.

Shawa soils are near the Dunul soils. Dunul soils are over 35 percent gravel throughout the profile and are less than 20 inches thick over sand and gravel.

Typical pedon of Shawa loam, 0 to 1 percent slopes, about 1,600 feet south and 2,550 feet east of the west quarter corner of sec. 23, T. 32 N., R. 8 E.:

Ap—0 to 4 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure parting to moderate fine granular; slightly hard, friable; calcareous; mildly alkaline; gradual smooth boundary.

A11—4 to 15 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure; slightly hard, friable; mildly alkaline; gradual smooth boundary.

A12—15 to 24 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; weak fine subangular

blocky structure parting to weak fine granular; hard, friable; mildly alkaline; gradual smooth boundary.
C—24 to 60 inches; pale brown (10YR 6/3) loam, dark brown (10YR 4/3) moist; weak medium and fine granular structure in the upper part and massive below; hard, friable; thin sand strata; mildly alkaline.

Texture ranges from loam to clay loam. The soil is normally leached of lime but can be slightly calcareous in places. Wormholes and worm casts are common to depths of 2 feet.

Space City series

The Space City series consists of deep, somewhat excessively drained soils that formed in wind-reworked alluvium or eolian sands of mixed mineralogy. Space City soils are in draws and pockets between basalt hills. Slopes are 1 to 9 percent. Mean annual precipitation is about 7 inches, and the mean annual air temperature is about 41 degrees F.

Space City soils are similar to Corlett soils and are near the Ryan Park and McGinty soils. Corlett soils are calcareous at or near the surface and have more than 15 percent exchangeable sodium. Ryan Park soils have a sandy loam B horizon. McGinty soils have a layer of concentrated calcium carbonate accumulation.

Typical pedon of Space City loamy fine sand, 1 to 9 percent slopes, about 790 feet north and 1,320 feet east of the southwest corner of sec. 12, T. 33 N., R. 10 E.:

A1—0 to 4 inches; light brownish gray (10YR 6/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; weak fine granular structure; soft; very friable; mildly alkaline; clear smooth boundary.
C1—4 to 28 inches; light brownish gray (10YR 6/2) loamy sand, brown (10YR 4/3) moist; single grained; loose when dry or moist; mildly alkaline; clear smooth boundary.
C2ca—28 to 40 inches; light brownish gray (10YR 6/2) loamy sand, brown (10YR 4/3) moist; single grained; loose when dry or moist; visible secondary calcium carbonate in thin seams and streaks; calcareous; moderately alkaline; clear smooth boundary.
C3ca—40 to 60 inches; light brownish gray (10YR 6/2) loamy fine sand, brown (10YR 4/3) moist; single grained; loose when dry or moist; visible secondary calcium carbonate in seams and streaks; calcareous; moderately alkaline.

Thickness of the A horizon ranges from 2 to 10 inches. Depth to calcareous material ranges from 22 to 30 inches.

Stunner series

The Stunner series consists of deep, well drained soils that formed in alluvium derived principally from basalt. Stunner soils are on nearly level to gently sloping fans and valley-filling side slopes. Slopes are 0 to 3 percent. Mean annual precipitation is about 10 inches, and the mean annual air temperature is about 41 degrees F.

Stunner soils are near the Cumbres, Empedrado, Luhon, and Monte soils. Cumbres soils are clayey and are more than 35 percent coarse material. Empedrado soils do not have a concentrated accumulation of calcium carbonate. Luhon soils do not have a B horizon. Monte soils do not have a B horizon or a calcic horizon.

Typical pedon of Stunner loam, near Bureau of Land Management Kingbird Reservoir, NE1/4NE1/4 sec. 22, T. 32 N., R. 8 E.:

A1—0 to 5 inches; yellowish brown (10YR 5/4) loam, dark yellowish brown (10YR 3/4) moist; weak fine granular structure; soft, very friable; a few basalt pebbles; many dark mineral grains in the sand fraction; neutral; clear smooth boundary.
B21t—5 to 8 inches; brown (7.5YR 5/4) clay loam, dark brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; hard, friable; a few thin clay films on peds and in some root channels; some basalt gravel; many dark magnetic mineral grains in the sand fraction; neutral; clear smooth boundary.
B22t—8 to 13 inches; brown (7.5YR 5/4) clay loam, dark brown (7.5YR 4/4) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable; peds are very hard; thin nearly continuous clay films on peds and in root channels; many dark magnetic mineral grains in the sand fraction; mildly alkaline; clear smooth boundary.
B3ca—13 to 21 inches; light brown (7.5YR 6/4) loam, brown (7.5YR 5/4) moist; weak medium prismatic structure parting to weak medium subangular blocky; hard, friable; few very thin patchy clay films on peds; many dark mineral grains in the sand fraction; calcareous with visible secondary calcium carbonate as concretions and in thin seams and streaks; moderately alkaline; clear smooth boundary.
C1ca—21 to 38 inches; light brown (10YR 6/4) loam, brown (10YR 5/4) moist; weak coarse prismatic structure parting to weak medium subangular blocky; hard, friable; many dark mineral grains; calcareous with much finely divided secondary carbonate visible as seams and concretions; moderately alkaline; clear smooth boundary.
C2ca—38 to 60 inches; light brown (10YR 6/4) loam, brown (10YR 5/4) moist; weak coarse prismatic structure parting to weak medium subangular blocky; hard, friable; many dark mineral grains; calcareous with visible secondary carbonate as concretions and in thin seams and streaks, but less carbonate than in the horizon above; moderately alkaline.

Depth to uniformly calcareous material ranges from 6 to 30 inches. Thickness of the solum ranges from 10 to 40 inches.

Travelers series

The Travelers series consists of shallow, excessively drained soils that formed in material weathered from basalt. Travelers soils are on basalt flows or mesas capped by basalt. Slopes are 1 to 25 percent. Mean annual precipitation is about 9 inches, and the mean annual air temperature is about 41 degrees F.

Travelers soils are near the Cumbres, Garita, Monte, and Luhon soils. Cumbres soils have a B2t horizon. Garita, Monte, and Luhon soils are more than 40 inches thick over bedrock. Monte and Luhon soils are less than 35 percent coarse fragments.

Typical pedon of Travelers very stony loam, 1 to 3 percent slopes, 1,450 feet north and 1,650 feet east of the southwest corner of sec. 16, T. 32 N., R. 9 E.:

A1—0 to 4 inches; brown (10YR 5/3) very stony loam, dark brown (10YR 4/3) moist; moderate fine granular structure; soft, very friable; 30 percent stones and cobbles and 20 percent angular gravel, mostly basalt; many dark mineral grains in sand fraction; calcareous; moderately alkaline; clear smooth boundary.

B2—4 to 12 inches; pale brown (10YR 6/3) very stony loam, brown (10YR 5/3) moist; moderate medium subangular blocky structure parting to weak fine granular; slightly hard, friable; 55 percent stone and 20 percent angular gravel, mostly basalt; many dark mineral grains in the sand fraction; calcareous; moderately alkaline; clear smooth boundary.

Cca—12 to 16 inches; very pale brown (10YR 7/3) very stony loam, brown (10YR 5/3) moist; massive; hard, friable; 50 percent stones and 30 percent angular gravel, mostly basalt; many dark mineral grains in the sand fraction; calcareous with secondary calcium carbonate visible as concretions, as thin seams and streaks, and as coatings on gravel fragments; moderately alkaline; abrupt smooth boundary.

R—16 inches; basalt.

Depth to calcareous material ranges from 0 to 4 inches. Depth to the lithic contact ranges from 10 to 20 inches.

Vastine series

The Vastine series consists of deep, poorly drained soils that formed in mixed alluvium. Vastine soils are on low terraces and flood plains. Slopes are 0 to 1 percent. Mean annual precipitation is about 7 inches, and the mean annual air temperature is about 41 degrees F.

Vastine soils are near the LaJara, Alamosa, and Nortonville soils. Alamosa and LaJara soil are more than 40 inches thick over sand. Nortonville soils have a layer of gypsum accumulation.

Typical pedon of Vastine loam is about 100 feet east and 150 feet south of the northwest corner of sec. 19, T. 36 N., R. 11 E.:

A11—0 to 3 inches; gray (10YR 5/1) loam, very dark gray (10YR 3/1) moist; few fine faint yellowish brown (10YR 5/6) mottles; weak thick platy structure parting to moderate fine granular; slightly hard, friable; common fine salt spots; moderately alkaline; clear smooth boundary.

A12g—3 to 12 inches; gray (10YR 5/1) clay loam, very dark gray (10YR 3/1) moist; common distinct coarse yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure parting to weak fine granular; hard, friable; moderately alkaline; gradual smooth boundary.

B21g—12 to 15 inches; gray (10YR 6/1) and pale brown (10YR 6/3) clay loam, dark gray (10YR 4/1) and brown (10YR 4/3) moist; weak coarse subangular blocky structure parting to moderate fine granular; hard, very friable; calcareous; moderately alkaline; clear smooth boundary.

B22g—15 to 37 inches; gray (10YR 6/1) and brownish yellow (10YR 6/8) loam, dark grayish brown (10YR 4/2) and yellowish brown (10YR 5/8) moist; massive; hard, friable; calcareous in spots; moderately alkaline; clear smooth boundary.

IICg—37 to 60 inches; fine sand; variegated colors; moderately alkaline.

Texture ranges from very fine sandy loam to clay loam in the upper 40 inches. Depth to seasonal water table ranges from 12 to about 30 inches.

Youga series

The Youga series consists of well drained soils formed in outwash material from mixed sources. Youga soils are on mountainsides and valley-filling side slopes in open parklike areas. Slopes range from 3 to 25 percent. The mean annual precipitation is about 18 inches, and the mean annual air temperature is about 36 degrees F.

Youga soils are similar to Miracle soils. They are near Bushvalley, Jerry, and Seitz soils. Miracle and Bushvalley soils are less than 40 inches thick over bedrock. Jerry soils have more clay in the control section than Youga soils. Seitz soils are under coniferous forest and have a very light-colored subsurface layer above the B horizon.

Typical pedon of Youga loam in an area of Bushvalley-Youga complex, 3 to 25 percent slopes, south of the east dam of La Jara Reservoir, about 980 feet north and 1,050 feet east of the southwest corner of sec. 29, T. 35 N., R. 6 E.:

A1—0 to 7 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, very friable; about 5 percent gravel; neutral; clear wavy boundary.

B21t—7 to 14 inches; very dark grayish brown (10YR 3/2) clay loam, very dark brown (10YR 2/2) moist; strong medium subangular blocky structure parting to strong fine subangular blocky; hard, firm; a few thin patchy clay films on vertical faces of peds; 5 percent gravel; neutral; clear smooth boundary.

B22t—14 to 31 inches; light brown (7.5YR 6/4) clay loam, dark brown (7.5YR 4/4) moist; strong medium subangular blocky structure; hard, firm; thin nearly continuous clay films on horizontal and vertical faces of peds; 5 percent gravel; neutral; clear smooth boundary.

C—31 to 44 inches; pinkish gray (7.5YR 6/2) gravelly clay loam, dark brown (7.5YR 4/2) moist; massive; hard, firm; about 30 percent gravel; neutral; abrupt smooth boundary.

R—44 to 60 inches; hard fractured rhyolite.

Content of rock fragments ranges from 0 to 35 percent by volume in a major part of the soil profile above a depth of 40 inches. Depth to bedrock ranges from 40 inches to more than 60 inches.

Zinzer series

The Zinzer series consists of deep, well drained soils that formed in mixed calcareous alluvium. Zinzer soils are on alluvial fans and terraces. Slopes are 0 to 3 percent. Mean annual precipitation is about 7 inches, and the mean annual air temperature is about 41 degrees F.

Zinzer soils are near the San Arcacio, Acacio, and LaSauses soils. San Arcacio soils have a B horizon and are 20 to 40 inches thick over sand and gravel. Acacio soils have a B horizon and a concentrated layer of calcium sulfate accumulation, generally above 20 inches. LaSauses soils are more than 35 percent clay in the control section.

Typical pedon of Zinzer loam about 200 feet east and 50 feet south of the north quarter corner of sec. 27, T. 35 N., R. 9 E.:

A11—0 to 7 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; weak thick platy structure parting to moderate fine granular; soft, very friable; calcareous; moderately alkaline; clear smooth boundary.

A12—7 to 11 inches; yellowish brown (10YR 5/4) loam, dark yellowish brown (10YR 3/4) moist; weak medium subangular blocky structure parting to weak fine granular; hard, friable; calcareous, moderately alkaline; clear smooth boundary.

AC—11 to 17 inches; yellowish brown (10YR 5/4) loam, dark yellowish brown (10YR 3/4) moist; massive; hard, friable; calcareous; moderately alkaline; clear smooth boundary.

C1ca—17 to 28 inches; yellowish brown (10YR 5/4) sandy clay loam, dark yellowish brown (10YR 3/4) moist; massive; slightly hard, very friable; calcareous visible calcium carbonate on gravel and in seams; moderately alkaline; clear smooth boundary.

C2cacs—28 to 60 inches; pale brown (10YR 6/3) clay loam, yellowish brown (10YR 5/4) moist; massive; hard, friable; calcareous with visible calcium carbonate and calcium sulfate occurring in pockets and as fine crystals; strongly alkaline.

Depth to the calcic horizon ranges from 10 to 40 inches. High concentrations of calcium sulfate occur in the calcic horizon in some pedons.

Classification

The system of soil classification currently used was adopted by the National Cooperative Soil Survey in 1965. Readers interested in further details about the system should refer to "Soil taxonomy" (*14*).

The system of classification has six categories. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. In this system the classification is based on the different soil properties that can be observed in the field or those that can be inferred either from other properties that are observable in the field or from the combined data of soil science and other disciplines. The properties selected for the higher categories are the result of soil genesis or of factors that affect soil genesis. In table 17, the soils of the survey area are classified according to the system. Categories of the system are discussed in the following paragraphs.

ORDER. Ten soil orders are recognized as classes in the system. The properties used to differentiate among orders are those that reflect the kind and degree of dominant soil-forming processes that have taken place. Each order is identified by a word ending in *sol*. An example is Entisol.

SUBORDER. Each order is divided into suborders based primarily on properties that influence soil genesis and are important to plant growth or that are selected to reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquent (*Aqu*, meaning water, plus *ent*, from Entisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of expression of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and a prefix that suggests something about the properties of the soil. An example is Haplaquents (*Hapl*, meaning simple horizons, plus *aquent*, the suborder of Entisols that have an aquic moisture regime).

SUBGROUP. Each great group may be divided into three subgroups: the central (typic) concept of the great groups, which is not necessarily the most extensive subgroup; the intergrades, or transitional forms to other

orders, suborders, or great groups; and the extragrades, which have some properties that are representative of the great groups but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that is thought to typify the great group. An example is Typic Haplaquents.

FAMILY. Families are established within a subgroup on the basis of similar physical and chemical properties that affect management. Among the properties considered in horizons of major biological activity below plow depth are particle-size distribution, mineral content, temperature regime, thickness of the soil penetrable by roots, consistence, moisture equivalent, soil slope, and permanent cracks. A family name consists of the name of a subgroup and a series of adjectives. The adjectives are the class names for the soil properties used as family differentiae. An example is fine-loamy, mixed, nonacid, mesic, Typic Haplaquents.

SERIES. The series consists of soils that formed in a particular kind of material and have horizons that, except for texture of the surface soil or of the underlying substratum, are similar in differentiating characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineral and chemical composition.

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Glossary

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly such soil formed in recent alluvium or on steep rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher), or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim. An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single mapping unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch

of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 5
Moderate	5 to 7.5
High	More than 7.5

Badland. Steep or very steep, commonly nonstony barren land dissected by many intermittent drainage channels. Badland is most common in semiarid and arid regions where streams are entrenched in soft geologic material. Local relief generally ranges from 25 to 500 feet. Runoff potential is very high, and geologic erosion is active.

Base saturation. The degree to which material having base exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the exchange capacity.

Bedding planes. Fine stratifications, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediments.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Blowout. A shallow depression from which all or most of the soil material has been removed by wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.

Bottom land. The normal flood plain of a stream, subject to frequent flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Broad-base terrace. A ridge-type terrace built to control erosion by diverting runoff along the contour at a nonscouring velocity. The terrace is 10 to 20 inches high and 15 to 30 feet wide and has gently sloping sides, a rounded crown, and a dish-shaped channel along the upper side. It may be nearly level or have a grade toward one or both ends.

Calcareous soil. A soil containing enough calcium carbonate (commonly with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid. A soil having measurable amounts of calcium carbonate or magnesium carbonate.

Caliche. A more or less cemented deposit of calcium carbonate in soils of warm-temperate, subhumid to arid areas. Caliche occurs as soft, thin layers in the soil or as hard, thick beds just beneath the solum, or it is exposed at the surface by erosion.

California bearing ratio (CBR). The load-supporting capacity of a soil as compared to that of a standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Channery soil. A soil, that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a fragment.

Chiseling. Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface. A form of emergency tillage to control soil blowing.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coat, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse fragments. Mineral or rock particles up to 3 inches (2 millimeters to 7.5 centimeters) in diameter.

Coarse textured (light textured) soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the bases of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures is difficult.

Complex, soil. A map unit of two or more kinds of soil occurring in such an intricate pattern that they cannot be shown separately on a soil map at the selected scale of mapping and publication.

Compressible. Excessive decrease in volume of soft soil under load.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is 40 or 80 inches (1 or 2 meters).

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave. Unstable walls of cuts made by earth-moving equipment. The soil sloughs easily.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. A delay in grazing until range plants have reached a specified stage of growth. Grazing is deferred in order to increase the vigor of forage and to allow desirable plants to produce seed. Contrasts with continuous grazing and rotation grazing.

Depth to rock. Bedrock at a depth that adversely affects the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically for long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients, as for example in "hillpeats" and "climatic moors."

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material

through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by running water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes a bare surface.

Erosion pavement. A layer of gravel or stones that remains on the ground surface after fine particles are removed by wind or water. Desert pavements result from wind erosion in arid areas.

Excess alkali. Excess exchangeable sodium. The resulting poor physical properties restrict the growth of plants.

Excess fines. Excess silt and clay. The soil does not provide a source of gravel or sand for construction purposes.

Excess lime. Excess carbonates. Excessive carbonates, or lime, restrict the growth of some plants.

Excess salts. Excess water soluble salts. Excessive salts restrict the growth of most plants.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grains are grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fast intake. The rapid movement of water into the soil.

Favorable. Favorable soil features for the specified use.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Fine textured (heavy textured) soil. Sandy clay, silty clay, and clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist, 6 to 15 inches (15 to 37.5 centimeters) long.

Flooding. The temporary covering of soil with water from overflowing streams, runoff from adjacent slopes, and tides. Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; *November-May*, for example, means that flooding can occur during the period November through May. Water standing for short periods after rainfall or commonly covering swamps and marshes is not considered flooding.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forage. Plant material used as feed by domestic animals. Forage can be grazed or cut for hay.

Forb. Any herbaceous plant not a grass or a sedge.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action. Freezing and thawing of soil moisture. Frost action can damage structures and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by melt water as it flows from glacial ice.

Glacial till (geology). Unassorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Gleyed soil. A soil having one or more neutral gray horizons as a result of waterlogging and lack of oxygen. The term "gleyed" also designates gray horizons and horizons having yellow and gray mottles as a result of intermittent waterlogging.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material from 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Green manure (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table, which is the upper limit of saturation.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Gypsum. Hydrous calcium sulphate.

Habitat. The natural abode of a plant or animal; refers to the kind of environment in which a plant or animal normally lives, as opposed to the range or geographical distribution.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. The major horizons of mineral soil are as follows:

O horizon.—An organic layer, fresh and decaying plant residue, at the surface of a mineral soil.

A horizon.—The mineral horizon, formed or forming at or near the surface, in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon most of which was originally part of a B horizon.

A2 horizon.—A mineral horizon, mainly a residual concentration of sand and silt high in content of resistant minerals as a result of the loss of silicate clay, iron, aluminum, or a combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or a combination of these; (2) by prismatic or blocky structure; (3) by redder or browner colors than those in the A horizon; or (4) by a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that from which the solum is presumed to have formed. If the material is known to differ from that in the solum the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Hummocky. Refers to a landscape of hillocks, separated by low sags, having sharply rounded tops and steep sides. Hummocky relief resembles rolling or undulating relief, but the tops of ridges are narrower and the sides are shorter and less even.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered, but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, invader plants are those that follow disturbance of the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Landslide. The rapid downhill movement of a mass of soil and loose rock generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones. Rock fragments 10 inches (25 centimeters) or more across. Large stones adversely affect the specified use.

Leaching. The removal of soluble material from soil or other material by percolating water.

Light textured soil. Sand and loamy sand.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low strength. Inadequate strength for supporting loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is greater than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous areas. Areas that have little or no natural soil, are too nearly inaccessible for orderly examination, or cannot otherwise be feasibly classified.

Moderately coarse textured (moderately light textured) soil. Sandy loam and fine sandy loam.

Moderately fine textured (moderately heavy textured) soil. Clay loam, sandy clay loam, and silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Muck. Dark colored, finely divided, well decomposed organic soil material mixed with mineral soil material. The content of organic matter is more than 20 percent.

Munsell notation. A designation of color by degrees of the three single variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3.

Nutrient, plant. Any element taken in by a plant, essential to its growth, and used by it in the production of food and tissue. Plant nutrients are nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, zinc, and perhaps other elements obtained from the soil; and carbon, hydrogen, and oxygen obtained largely from the air and water.

Outwash, glacial. Stratified sand and gravel produced by glaciers and carried, sorted, and deposited by water that originated mainly from the melting of glacial ice. Glacial outwash is commonly in valleys on landforms known as valley trains, outwash terraces, eskers, kame terraces, kames, outwash fans, or deltas.

Outwash plain. A land form of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

Pan. A compact, dense layer in a soil. A pan impedes the movement of water and the growth of roots. The word "pan" is commonly combined with other words that more explicitly indicate the nature of the layer; for example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan.*

Parent material. The great variety of unconsolidated organic and mineral material in which soil forms. Consolidated bedrock is not yet parent material by this concept.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly. The slow movement of water through the soil adversely affecting the specified use.

Permafrost. Layers of soil, or even bedrock, occuring in arctic or subarctic regions, in which a temperature below freezing has existed continuously for a long time.

Permeability. The quality that enables the soil to transmit water or air, measured as the number of inches per hour that water moves through the soil. Terms describing permeability are *very slow* (less than 0.06 inch), *slow* (0.06 to 0.20 inch), *moderately slow* (0.2 to 0.6 inch), *moderate* (0.6 to 2.0 inches), *moderately rapid* (2.0 to 6.0 inches), *rapid* (6.0 to 20 inches), and *very rapid* (more than 20 inches).

Phase, soil. A subdivision of a soil series or other unit in the soil classification system based on differences in the soil that affect its management. A soil series, for example, may be divided into phases on the bases of differences in slope, stoniness, thickness, or some other characteristic that affects management. These differences are too small to justify separate series.

pH value. (See Reaction, soil). A numerical designation of acidity and alkalinity in soil.

Piping. Moving water of subsurface tunnels or pipelike cavities in the soil.

Pitting. Formation of pits as a result of the melting of ground ice after the removal of plant cover.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from a semisolid to a plastic state.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Polypedon. A volume of soil having properties within the limits of a soil series, the lowest and most homogeneous category of soil taxonomy. A "soil individual."

Poorly graded. Refers to soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor outlets. Surface or subsurface drainage outlets difficult or expensive to install.

Productivity (soil). The capability of a soil for producing a specified plant or sequence of plants under a specified system of management. Productivity is measured in terms of output, or harvest, in relation to input.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Range (or rangeland). Land that, for the most part, produces native plants suitable for grazing by livestock; includes land supporting some forest trees.

Range condition. The health or productivity of forage plants on a given range, in terms of the potential productivity under normal climate and the best practical management. Condition classes generally recognized are—*excellent, good, fair,* and *poor.* The classification is based on the percentage of original, or assumed climax vegetation on a site, as compared to what has been observed to grow on it when well managed.

Range site. An area of range where climate, soil, and relief are sufficiently uniform to produce a distinct kind and amount of native vegetation.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock. Soil scientists regard as soil only the part of the regolith that is modified by organisms and other soil-building forces.

Most engineers describe the whole regolith, even to a great depth, as "soil."

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulates over disintegrating rock.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth. Shallow root zone. The soil is shallow over a layer that greatly restricts roots. See Root zone.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged in stream channels from a drainage area. The water that flows off the land surface without sinking in is called surface runoff; that which enters the ground before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline-alkali soil. A soil that contains a harmful concentration of salts and exchangeable sodium; contains harmful salts and is strongly alkaline; or contains harmful salts and exchangeable sodium and is very strongly alkaline. The salts, exchangeable sodium, and alkaline reaction are in the soil in such location that growth of most crop plants is less than normal.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saprolite (geology). Soft, earthy, clay-rich, thoroughly decomposed rock formed in place by chemical weathering of igneous and metamorphic rock. In soil survey, the term saprolite is applied to any unconsolidated residual material underlying the soil and grading to hard bedrock below.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage. The rapid movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon.

Series, soil. A group of soils, formed from a particular type of parent material, having horizons that, except for the texture of the A or surface horizon, are similar in all profile characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineralogical and chemical composition.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff water.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silica-alumina ratio. The molecular ratio of silica to alumina in soil, clay, or any alumino-silicate mineral.

Silica-sesquioxide ratio. The ratio of the number of molecules of silica to the number of molecules of alumina and iron oxide. The more highly weathered soils or their clay fractions in warm-temperate, humid regions, and especially those in the tropics, generally have a low ratio.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Sinkhole. A depression in a landscape where limestone has been locally dissolved.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slick spot. Locally, a small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil is generally silty or

clayey, is slippery when wet, and is low in productivity.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slow intake. The slow movement of water into the soil.

Slow refill. The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones. Rock fragments 3 to 10 inches (7.5 to 25 centimeters) in diameter. Small stones adversely affect the specified use.

Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na^{+} to $Ca^{++} + Mg^{++}$ The degrees of sodicity are—

	SAR
Slight	Less than 13:1
Moderate	13-30:1
Strong	More than 30:1

Soil. A natural, three-dimensional body at the earth's surface that is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows: *very coarse sand* (2.0 millimeters to 1.0 millimeter); *coarse sand* (1.0 to 0.5 millimeter); *medium sand* (0.5 to 0.25 millimeter); *fine sand* (0.25 to 0.10 millimeter); *very fine sand* (0.10 to 0.05 millimeter); *silt* (0.005 to 0.002 millimeter); and *clay* (less than 0.002 millimeter).

Solodized soil. A formerly alkali (sodic) soil that has been leached so that it has become acid and has a thick, gray upper layer over an acid, blocky B horizon. The resulting soil may be termed a Soloth.

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in mature soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristics of the soil are largely confined to the solum.

Stone line. A concentration of coarse fragments in soils that generally marks an old weathering surface. In a cross section, the line may be one fragment or more thick. The line generally overlies material that weathered in place and marks the top of a paleosol. It is ordinarily overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stratified. Arranged in strata, or layers. The term refers to geologic material. Layers in soils that result from the processes of soil formation are called horizons; those inherited from the parent material are called strata.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates that are separated from adjoining aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil, or partly worked into the soil, to provide protection from soil blowing and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use or management.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so

that it can soak into the soil or flow slowly to a prepared outlet without harm. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea. A stream terrace is frequently called a second bottom, in contrast with a flood plain, and is seldom subject to overflow. A marine terrace, generally wide, was deposited by the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt, silt loam, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer. Otherwise suitable soil material too thin for the specified use.

Till plain. An extensive flat to undulating area underlain by glacial till.

Tilth, soil. The condition of the soil, especially the soil structure, as related to the growth of plants. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil (engineering). Presumably a fertile soil or soil material, or one that responds to fertilization, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

Trace elements. The chemical elements in soils, in only extremely small amounts, essential to plant growth. Examples are zinc, cobalt, manganese, copper, and iron.

Tuff. A compacted deposit 50 percent or more volcanic ash and dust.

Type II cement. A type of Portland cement that, compared to standard cement (Type I), has a lower heat of hydration, generates heat at a slower rate, and has improved resistance to sulfate attack.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Unstable fill. Risk of caving or sloughing in banks of fill material.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial melt water. In nonglaciated regions, alluvium deposited by heavily loaded streams emerging from hills or mountains and spreading sediments onto the lowland as a series of adjacent alluvial fans.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but the limited geographic soil area does not justify creation of a new series.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve. A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within 1 year; specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Water table. The upper limit of the soil or underlying rock material that is wholly saturated with water.

Water table, apparent. A thick zone of free water in the soil. An apparent water table is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil.

Water table, artesian. A water table under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole.

Water table, perched. A water table standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to a soil or soil material consisting of particles well distributed over a wide range in size or diameter. Such a soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

ILLUSTRATIONS

Figure 1.—Basalt bedrock escarpment along Rio Grande River near New Mexico. Shallow Travelers soils overlie the bedrock.

Figure 2.—Malting barley on San Arcacio-Zinzer map unit.

Figure 3.—Catchment basin for livestock water on Travelers-Garita map unit. Stock water facilities help prevent overgrazing.

Figure 4.—Spring-fall sheep range on Cumbres-Empedrado-Curecanti map unit. Thin stands of pinyon pine are common on this unit.

Figure 5.—Summer range on Bushvalley-Miracle-Youga map unit near La Jara Reservoir. Seitz-Bushvalley unit is on wooded ridge in background.

Figure 6.—Cottonwood forest on Aquic Ustorthents, gravelly, near Conejos River. Flooding and high water table are major limitations on these soils.

Figure 7.—Alfalfa and barley are normally grown on irrigated Graypoint soils along La Jara Creek.

Figure 8.—Land smoothing prior to spring planting on Platoro loam. Wind erosion is a hazard on clean cultivated field in spring.

Figure 9.—Irrigated potatoes on Platoro soils. Land leveling aids proper distribution of irrigation water and helps improve yields.

Figure 10.—Harvesting potatoes on San Arcacio sandy loam.

Figure 11.—Stoniness and steepness of slope limit use of equipment on Sietz very stony loam, 10 to 65 percent slopes.

Figure 12.—Windblown soil from clean cultivated field of Shawa loam, 1 to 3 percent slopes.

Figure 13.—Flood irrigation of native hay meadow on Shawa loam, wet. Management practices such as land leveling would increase efficiency of irrigation and conserve water.

Figure 14.—Typical landscape on Travelers very stony loam, 1 to 3 percent slopes, close to New Mexico.

Figure 15.—Adobe houses near Canon. Eroded mesa reveals bedrock in background. Shawa soils are in foreground.

TABLES

TABLE 1.--TEMPERATURE AND PRECIPITATION DATA

Month	Temperature[1]						Precipitation[1]				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[2]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F		In	In	In		In
January----	37.0	1.2	19.1	56	-26	0	.29	.02	.48	1	3.7
February---	41.9	7.2	24.6	61	-19	15	.27	.06	.43	1	3.6
March------	49.5	15.9	32.7	69	-9	28	.32	.11	.48	1	4.6
April------	59.0	23.4	41.2	74	5	105	.46	.15	.71	2	3.3
May--------	68.8	32.6	50.7	83	16	332	.78	.35	1.13	2	.5
June-------	77.6	40.8	59.2	89	27	576	.58	.10	.94	2	.0
July-------	81.7	45.5	63.6	90	35	732	1.48	.84	2.00	4	.0
August-----	79.5	43.5	61.5	88	30	667	1.44	.63	2.09	4	.0
September--	74.3	35.7	55.0	86	19	450	.79	.11	1.30	3	.2
October----	64.5	25.5	45.0	79	6	176	.79	.20	1.26	2	3.1
November---	49.6	13.4	31.5	68	-11	41	.37	.05	.62	1	4.0
December---	38.7	3.7	21.2	59	-23	22	.31	.03	.52	1	4.6
Year-----	60.2	24.0	42.1	91	-27	3,144	7.88	6.04	9.59	24	27.6

[1]Recorded in the period 1952-74 at Manassa, CO.

[2]A growing degree day is an index of the amount of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40° F.).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

Probability	Minimum temperature[1]		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	May 30	June 9	June 22
2 years in 10 later than--	May 24	June 4	June 18
5 years in 10 later than--	May 12	May 26	June 9
First freezing temperature in fall:			
1 year in 10 earlier than--	September 12	September 5	August 3
2 years in 10 earlier than--	September 17	September 9	August 13
5 years in 10 earlier than--	September 27	September 18	August 30

[1]Recorded in the period 1952-74 at Manassa, CO.

TABLE 3.--GROWING SEASON LENGTH

Probability	Daily minimum temperature during growing season		
	Higher than 24° F.	Higher than 28° F.	Higher than 32° F.
	Days	Days	Days
9 years in 10	111	93	51
8 years in 10	120	100	61
5 years in 10	137	114	81
2 years in 10	154	129	102
1 year in 10	163	136	112

[1]Recorded in the period 1952-74 at Manassa, CO.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
1	Acacio sandy loam	800	0.2
2	Alamosa loam	1,250	0.3
3	Aquic Ustorthents, gravelly	1,050	0.2
4	Aquolls and Aquents, frequently flooded	1,200	0.2
5	Arena loam	900	0.2
6	Arena loam, drained	958	0.2
7	Bushvalley very stony loam, 10 to 40 percent slopes	2,450	0.5
8	Bushvalley-Youga complex, 3 to 25 percent slopes	14,800	3.0
9	Corlett-Hooper complex, undulating	750	0.2
10	Cryaquolls and Histosols, flooded	3,250	0.7
11	Cumbres very stony loam, 1 to 9 percent slopes	9,700	2.0
12	Derrick very cobbly sandy loam, 0 to 1 percent slopes	7,950	1.6
13	Derrick very cobbly sandy loam, 1 to 3 percent slopes	3,700	0.8
14	Dunul gravelly sandy loam	950	0.2
15	Dunul-Lamanga complex	4,550	0.9
16	Empedrado-Curecanti complex, 5 to 25 percent slopes	16,450	3.4
17	Garita cobbly loam, 0 to 3 percent slopes	8,950	1.8
18	Garita cobbly loam, 3 to 25 percent slopes	49,650	10.2
19	Graypoint gravelly sandy loam, 0 to 1 percent slopes	29,200	6.0
20	Graypoint gravelly sandy loam, 1 to 3 percent slopes	15,100	3.1
21	Graypoint gravelly sandy loam, wet	6,350	1.3
22	Hooper clay loam	3,150	0.6
23	Hooper loamy sand	5,300	1.1
24	Jerry loam, 3 to 25 percent slopes	2,600	0.5
25	LaJara loam	16,000	3.3
26	Lamanga sandy clay loam	4,350	0.9
27	LaSauses sandy clay loam	8,600	1.8
28	Luhon loam, 1 to 3 percent slopes	6,200	1.3
29	Luhon loam, 3 to 9 percent slopes	7,350	1.5
30	McGinty sandy loam	2,350	0.5
31	McGinty sandy loam, fan, 1 to 3 percent slopes	8,900	1.8
32	McGinty sandy loam, fan, 3 to 9 percent slopes	3,600	0.7
33	Miracle loam, 3 to 9 percent slopes	5,600	1.1
34	Mishak loam	1,100	0.2
35	Mishak loam, drained	3,600	0.7
36	Mogote loam	9,200	1.9
37	Monte loam, 0 to 1 percent slopes	1,450	0.3
38	Monte loam, 1 to 3 percent slopes	6,350	1.3
39	Mosca loamy sand	2,200	0.5
40	Mosca loamy sand, saline	2,400	0.5
41	Nortonville loam	3,600	0.7
42	Platoro loam	6,850	1.4
43	Quamon-LaJara complex	20,750	4.3
44	Ryan Park sandy loam, 3 to 5 percent slopes	4,800	1.0
45	San Arcacio sandy loam	12,000	2.5
46	San Arcacio sandy loam, saline	9,350	1.9
47	Seitz very stony loam, 10 to 65 percent slopes	19,100	3.9
48	Shawa loam, 0 to 1 percent slopes	2,700	0.6
49	Shawa loam, 1 to 3 percent slopes	1,400	0.3
50	Shawa loam, wet	6,100	1.3
51	Space City loamy fine sand, 1 to 9 percent slopes	1,200	0.2
52	Stunner loam	3,100	0.6
53	Travelers very stony loam, 1 to 3 percent slopes	21,900	4.5
54	Travelers very stony loam, 3 to 25 percent slopes	78,700	16.1
55	Vastine loam	1,200	0.2
56	Zinzer loam	5,600	1.1
57	Zinzer loam, saline	4,600	1.0
	Water	4,150	0.9
	Total	487,358	100.0

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. The estimates were made in 1974. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Grass-legume hay	Alfalfa hay	Barley	Potatoes, Irish	Lettuce
	Ton	Ton	Bu	Cwt	Crate
Acacio:					
1	2.5	3.0	85	250	---
Alamosa:					
2	2.5	2.5	65	---	---
Aquic Ustorthents:					
3	1.5	---	---	---	---
Aquolls:					
4	2.0	---	55	---	---
Arena:					
5	1.5	1.0	40	---	---
6	2.5	2.5	70	---	---
Derrick:					
12, 13	1.5	1.75	45	200	300
Dunul:					
14	1.5	1.75	45	---	---
15	1.75	2.0	55	---	---
Garita:					
17	1.0	1.5	---	---	---
Graypoint:					
19, 20	2.0	2.5	70	250	---
21	2.5	2.0	60	---	---
Hooper:					
23	0.5	---	---	---	---
LaJara:					
25	3.0	3.0	75	---	---
Lamanga:					
26	3.0	3.0	70	---	---
LaSauses:					
27	0.7	1.0	40	---	---
Luhon:					
28	3.0	3.0	75	---	---
McGinty:					
30	3.0	3.0	85	350	500
31	2.5	2.5	70	250	---
Mishak:					
34	1.2	---	---	---	---
35	2.0	2.0	60	---	---
Mogote:					
36	3.0	3.0	65	---	---
Monte:					
37	3.0	3.0	80	275	500
38	2.5	2.75	70	---	---

See footnote at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Grass-legume hay	Alfalfa hay	Barley	Potatoes, Irish	Lettuce
	Ton	Ton	Bu	Cwt	Crate
Mosca:					
39	2.5	2.5	65	300	---
40	1.5	1.5	50	---	---
Nortonville:					
41	2.0	2.5	55	---	---
Platoro:					
42	3.0	3.5	80	300	500
Quamon:					
43[1]	2.0	1.5	50	200	---
San Arcacio:					
45	3.0	3.0	80	300	500
46	1.75	---	---	---	---
Shawa:					
48	2.0	3.0	80	250	---
49	2.0	2.75	75	---	---
50	2.0	2.5	80	---	---
Vastine:					
55	2.5	2.0	75	---	---
Zinzer:					
56	3.0	3.5	80	275	550
57	2.0	---	---	---	---

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole unit.

TABLE 6.--RANGE PRODUCTIVITY AND COMPOSITION

[Only the soils that support rangeland vegetation are listed]

Soil name and map symbol	Range site	Potential production		Characteristic species	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Acacio:					
1	Salt flats	Favorable	1,200	Alkali sacaton	40
		Normal	800	Rubber rabbitbrush	10
		Unfavorable	600	Black greasewood	10
				Inland saltgrass	10
				Alkali cordgrass	5
				Western wheatgrass	5
				Blue grama	5
Alamosa:					
2	Salt meadow	Favorable	3,000	Western wheatgrass	20
		Normal	2,500	Alkali sacaton	20
		Unfavorable	2,000	Slender wheatgrass	15
				Sedge	15
				Willow	5
				Rush	5
Aquic Ustorthents:					
[1]3	Wet meadow	Favorable	1,500	Tufted hairgrass	30
		Normal	1,200	Sedge	25
		Unfavorable	1,000	Slender wheatgrass	10
				Bluejoint reedgrass	5
				Rush	5
Aquolls:					
[1]4:					
Aquolls part	Salt meadow	Favorable	2,500	Alkali sacaton	50
		Normal	2,000	Western wheatgrass	12
		Unfavorable	1,500	Slender wheatgrass	5
				Sedge	5
				Willow	5
Aquents part	Salt meadow	Favorable	2,500	Alkali sacaton	45
		Normal	2,000	Western wheatgrass	15
		Unfavorable	1,500	Willow	7
				Slender wheatgrass	5
				Sedge	5
Arena:					
5	Salt flats	Favorable	1,200	Alkali sacaton	35
		Normal	1,000	Inland saltgrass	15
		Unfavorable	600	Black greasewood	10
				Rush	10
				Alkali cordgrass	10
				Rabbitbrush	5
				Western wheatgrass	5
6	Salt flats	Favorable	900	Alkali sacaton	35
		Normal	700	Inland saltgrass	10
		Unfavorable	500	Alkali cordgrass	10
				Rubber rabbitbrush	10
				Black greasewood	10
				Western wheatgrass	5
Bushvalley:					
7	Shallow loam	Favorable	900	Arizona fescue	35
		Normal	700	Mountain muhly	15
		Unfavorable	500	Parry oatgrass	10
				Rubber rabbitbrush	10
				Blue grama	5
				Muttongrass	5
[1]8:					
Bushvalley part	Shallow loam	Favorable	900	Arizona fescue	35
		Normal	700	Mountain muhly	15
		Unfavorable	500	Parry oatgrass	10
				Rubber rabbitbrush	10
				Blue grama	5
				Muttongrass	5

See footnote at end of table.

TABLE 6.--RANGE PRODUCTIVITY AND COMPOSITION--Continued

Soil name and map symbol	Range site	Potential production		Characteristic species	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Bushvalley:					
18:					
Youga part-------	Loamy park----------	Favorable	3,000	Arizona fescue----------	35
		Normal	2,500	Parry oatgrass----------	10
		Unfavorable	1,500	Mountain muhly----------	15
				Rubber rabbitbrush----------	5
				Muttongrass----------	5
Corlett:					
19:					
Corlett part-----	Sand hummocks----------	Favorable	650	Fourwing saltbush----------	30
		Normal	500	Black greasewood----------	20
		Unfavorable	300	Rubber rabbitbrush----------	10
				Alkali sacaton----------	8
				Indian ricegrass----------	5
				Inland saltgrass----------	5
				Sand muhly----------	5
Hooper part------	Salt flats----------	Favorable	1,000	Alkali sacaton----------	50
		Normal	750	Black greasewood----------	30
		Unfavorable	500	Inland saltgrass----------	10
				Rubber rabbitbrush----------	5
Cryaquolls:					
110:					
Cryaquolls part-	Mountain meadow----------	Favorable	4,000	Tufted hairgrass----------	40
		Normal	3,000	Sedge----------	22
		Unfavorable	2,000	Slender wheatgrass----------	10
Histosols part--	Mountain meadow----------	Favorable	4,000	Sedge----------	65
		Normal	3,500	Tufted hairgrass----------	15
		Unfavorable	3,000		
Cumbres:					
11----------	Foothill loam----------	Favorable	1,500	Western wheatgrass----------	40
		Normal	1,000	Needleandthread----------	15
		Unfavorable	700	Blue grama----------	5
				Rubber rabbitbrush----------	5
				Fourwing saltbush----------	5
Derrick:					
12, 13----------	Mountain outwash----------	Favorable	700	Blue grama----------	25
		Normal	500	Indian ricegrass----------	15
		Unfavorable	300	Winterfat----------	10
				Ring muhly----------	10
				Bottlebrush squirreltail------	5
				Western wheatgrass----------	5
				Sand dropseed----------	5
				Red threeawn----------	5
				Rabbitbrush----------	5
				Broom snakeweed----------	5
				Fourwing saltbush----------	5
Dunul:					
14----------	Mountain outwash----------	Favorable	600	Blue grama----------	25
		Normal	450	Bottlebrush squirreltail------	15
		Unfavorable	300	Rabbitbrush----------	15
				Indian ricegrass----------	10
				Sand dropseed----------	10
				Western wheatgrass----------	5
				Needleandthread----------	5
				Red threeawn----------	5
				Fringed sagebrush----------	5

See footnote at end of table.

TABLE 6.--RANGE PRODUCTIVITY AND COMPOSITION--Continued

Soil name and map symbol	Range site	Potential production		Characteristic species	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Dunul:					
[1]15:					
Dunul part------	Mountain outwash----------	Favorable	600	Blue grama----------	25
		Normal	450	Bottlebrush squirreltail------	15
		Unfavorable	300	Rabbitbrush----------	15
				Indian ricegrass----------	10
				Sand dropseed----------	10
				Western wheatgrass----------	5
				Needleandthread----------	5
				Red threeawn----------	5
				Fringed sagebrush----------	5
Lamanga part----	Salt meadow----------	Favorable	2,500	Alkali sacaton----------	50
		Normal	2,000	Western wheatgrass----------	15
		Unfavorable	1,500	Slender wheatgrass----------	5
				Sedge----------	5
				Rush----------	5
Empedrado:					
[1]16:					
Empedrado part--	Rocky foothills----------	Favorable	1,600	Western wheatgrass----------	40
		Normal	1,200	Needleandthread----------	15
		Unfavorable	800		
Curecanti part--	Rocky foothills----------	Favorable	1,000	Arizona fescue----------	20
		Normal	850	Mountain muhly----------	10
		Unfavorable	600	Indian ricegrass----------	10
				Muttongrass----------	10
				Scribners needlegrass----------	8
				Sand dropseed----------	5
				Prairie junegrass----------	5
				Bottlebrush squirreltail------	5
				Needleandthread	5
Garita:					
17, 18----------	Limy bench----------	Favorable	800	Winterfat----------	30
		Normal	600	Fourwing saltbush----------	15
		Unfavorable	400	Fringed sagebrush----------	10
				Indian ricegrass----------	10
				Blue grama----------	10
				Rubber rabbitbrush----------	5
Graypoint:					
19, 20----------	Mountain outwash----------	Favorable	800	Blue grama----------	25
		Normal	550	Indian ricegrass----------	15
		Unfavorable	300	Bottlebrush squirreltail------	10
				Winterfat----------	10
				Western wheatgrass----------	5
				Sand dropseed----------	5
				Ring muhly----------	5
				Fourwing saltbush----------	5
				Rabbitbrush----------	5
				Broom snakeweed----------	5
21----------	Salt meadow----------	Favorable	1,800	Alkali sacaton----------	60
		Normal	1,500	Sedge----------	10
		Unfavorable	1,000	Mat muhly----------	5
				Rush----------	5
				Black greasewood----------	5
Hooper:					
22----------	Salt flats----------	Favorable	500	Black greasewood----------	85
		Normal	350	Inland saltgrass----------	5
		Unfavorable	250	Rubber rabbitbrush----------	5
23----------	Salt flats----------	Favorable	1,000	Alkali sacaton----------	50
		Normal	750	Black greasewood----------	30
		Unfavorable	500	Inland saltgrass----------	10
				Rubber rabbitbrush----------	5

See footnote at end of table.

TABLE 6.--RANGE PRODUCTIVITY AND COMPOSITION--Continued

Soil name and map symbol	Range site	Potential production		Characteristic species	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Jerry:					
24	Subalpine loam	Favorable	3,000	Western wheatgrass	10
		Normal	2,500	Thurber fescue	10
		Unfavorable	2,000	Sedge	10
				Nodding bromegrass	5
				Big bluegrass	5
				Idaho fescue	5
				Slender wheatgrass	5
				Prairie junegrass	5
				Common snowberry	5
				Shrubby cinquefoil	
LaJara:					
25	Salt meadow	Favorable	2,500	Alkali sacaton	50
		Normal	2,000	Western wheatgrass	15
		Unfavorable	1,500	Slender wheatgrass	5
				Sedge	5
				Rush	5
				Inland saltgrass	5
				Creeping wildrye	5
Lamanga:					
26	Salt meadow	Favorable	2,500	Alkali sacaton	50
		Normal	2,000	Western wheatgrass	15
		Unfavorable	1,500	Slender wheatgrass	5
				Sedge	5
				Rush	5
				Creeping wildrye	5
LaSauses:					
27	Salt flats	Favorable	1,200	Alkali sacaton	45
		Normal	900	Black greasewood	15
		Unfavorable	600	Inland saltgrass	10
				Rubber rabbitbrush	10
				Western wheatgrass	5
				Sedge	7
				Creeping wildrye	5
Luhon:					
28, 29	Limy bench	Favorable	800	Winterfat	25
		Normal	600	Blue gramagrass	20
		Unfavorable	400	Indian ricegrass	10
				Fourwing saltbush	10
				Needleandthread	10
				Rubber rabbitbrush	5
McGinty:					
30	Valley sand	Favorable	1,100	Alkali sacaton	50
		Normal	800	Inland saltgrass	10
		Unfavorable	500	Black greasewood	8
				Blue grama	7
				Western wheatgrass	7
				Sand dropseed	5
				Rubber rabbitbrush	5
				Fourwing saltbush	5
31, 32	Sandy bench	Favorable	1,000	Sand dropseed	20
		Normal	600	Blue grama	15
		Unfavorable		Indian ricegrass	15
				Winterfat	10
				Western wheatgrass	10
				Rabbitbrush	10
				Needleandthread	5
				Broom snakeweed	5
Miracle:					
33	Rocky foothills	Favorable	1,500	Arizona fescue	20
		Normal	1,100	Scribners needlegrass	15
		Unfavorable	900	Western wheatgrass	15
				Muttongrass	15
				Needleandthread	10
				Indian ricegrass	5
				Fringed sagebrush	5

See footnote at end of table.

TABLE 6.--RANGE PRODUCTIVITY AND COMPOSITION--Continued

Soil name and map symbol	Range site	Potential production		Characteristic species	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Mishak:					
34	Salt meadow	Favorable	2,500	Alkali sacaton	50
		Normal	2,000	Alkali cordgrass	10
		Unfavorable	1,500	Western wheatgrass	10
				Creeping wildrye	5
				Inland saltgrass	5
				Rush	5
35	Salt meadow	Favorable	2,300	Alkali sacaton	45
		Normal	1,800	Western wheatgrass	15
		Unfavorable	1,200	Alkali cordgrass	10
				Inland saltgrass	5
				Rubber rabbitbrush	5
				Black greasewood	5
				Creeping wildrye	5
Mogote:					
36	Salt flats	Favorable	1,800	Alkali sacaton	45
		Normal	1,500	Sedge	10
		Unfavorable	1,200	Inland saltgrass	10
				Western wheatgrass	10
				Black greasewood	10
				Rubber rabbitbrush	5
				Creeping wildrye	5
Monte:					
37, 38	Mountain outwash	Favorable	800	Blue grama	25
		Normal	600	Bottlebrush squirreltail	15
		Unfavorable	300	Indian ricegrass	10
				Western wheatgrass	10
				Winterfat	10
				Needleandthread	5
				Sand dropseed	5
				Fendler threeawn	5
				Fourwing saltbush	5
				Rubber rabbitbrush	5
Mosca:					
39	Valley Sand	Favorable	1,200	Rabbitbrush	30
		Normal	900	Black greasewood	20
		Unfavorable	700	Blue grama	15
				Sand dropseed	10
				Alkali sacaton	10
				Indian ricegrass	5
				Alkali cordgrass	5
				Creeping wildrye	5
40	Salt flats	Favorable	1,500	Alkali sacaton	30
		Normal	1,200	Black greasewood	20
		Unfavorable	900	Inland saltgrass	15
				Sedge	10
				Rubber rabbitbrush	10
				Alkali cordgrass	5
Nortonville:					
41	Salt meadow	Favorable	2,500	Alkali sacaton	70
		Normal	2,000	Mat muhly	5
		Unfavorable	1,500	Rush	5
				Inland saltgrass	5
Platoro:					
42	Mountain outwash	Favorable	850	Blue grama	20
		Normal	600	Indian ricegrass	15
		Unfavorable	350	Western wheatgrass	15
				Bottlebrush squirreltail	10
				Winterfat	10
				Sand dropseed	7

See footnote at end of table.

TABLE 6.--RANGE PRODUCTIVITY AND COMPOSITION--Continued

Soil name and map symbol	Range site	Potential production		Characteristic species	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Quamon:					
43:					
Quamon part	Mountain outwash	Favorable	750	Western wheatgrass	15
		Normal	600	Blue grama	15
		Unfavorable	450	Rabbitbrush	15
				Sand dropseed	10
				Bottlebrush squirreltail	10
				Indian ricegrass	10
				Needleandthread	5
				Sedge	5
				Fringed sagebrush	5
LaJara part	Wet meadow	Favorable	2,500	Alkali sacaton	50
		Normal	2,000	Western wheatgrass	15
		Unfavorable	1,500	Slender wheatgrass	5
				Sedge	5
				Rush	5
				Inland saltgrass	5
Ryan Park:					
44	Sandy bench	Favorable	1,200	Blue grama	20
		Normal	1,000	Indian ricegrass	15
		Unfavorable	700	Sand dropseed	15
				Needleandthread	10
				Western wheatgrass	10
				Rabbitbrush	10
San Arcacio:					
45	Salt flats	Favorable	1,200	Alkali sacaton	25
		Normal	900	Western wheatgrass	20
		Unfavorable	600	Blue grama	20
				Rubber rabbitbrush	15
				Sand dropseed	5
				Black greasewood	5
				Sedge	5
46	Salt flats	Favorable	1,400	Alkali sacaton	40
		Normal	1,150	Inland saltgrass	15
		Unfavorable	850	Rubber rabbitbrush	10
				Black greasewood	10
				Alkali cordgrass	5
				Rush	5
				Sedge	5
Shawa:					
48, 49	Foothill loam	Favorable	1,600	Western wheatgrass	40
		Normal	1,200	Needleandthread	15
		Unfavorable	800	Sedge	5
				Blue grama	5
				Rubber rabbitbrush	5
50	Wet meadow	Favorable	2,700	Sedge	25
		Normal	2,250	Tufted hairgrass	20
		Unfavorable	1,800	Slender wheatgrass	10
				Western wheatgrass	10
				Alkali sacaton	10
				Bluejoint reedgrass	5
				Rush	5
Space City:					
51	Sandy bench	Favorable	1,200	Indian ricegrass	30
		Normal	900	Needleandthread	20
		Unfavorable	600	Blue grama	15
				Spike dropseed	10
				Rabbitbrush	10
				Sand dropseed	5

See footnote at end of table.

TABLE 6.--RANGE PRODUCTIVITY AND COMPOSITION--Continued

Soil name and map symbol	Range site	Potential production		Characteristic species	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Stunner:					
52	Valley bench	Favorable	1,100	Winterfat	25
		Normal	800	Bottlebrush squirreltail	15
		Unfavorable	400	Blue grama	15
				Indian ricegrass	10
				Western wheatgrass	10
				Rabbitbrush	5
				Big sagebrush	5
Travelers:					
53	Limy bench	Favorable	800	Blue grama	15
		Normal	600	Winterfat	15
		Unfavorable	400	Indian ricegrass	10
				Rabbitbrush	10
				Fourwing saltbush	10
				Western wheatgrass	5
				Needleandthread	5
				Sand dropseed	5
				Big sagebrush	5
54	Basalt hills	Favorable	700	Blue grama	15
		Normal	500	Winterfat	10
		Unfavorable	300	Indian ricegrass	10
				Rabbitbrush	10
				Fourwing saltbush	10
				Western wheatgrass	10
				Needleandthread	5
				Sand dropseed	5
				Big sagebrush	5
Vastine:					
55	Wet meadow	Favorable	3,000	Sedge	25
		Normal	2,500	Tufted hairgrass	20
		Unfavorable	2,000	Slender wheatgrass	10
				Western wheatgrass	10
				Needlegrass	5
				Bluejoint reedgrass	5
				Alkali sacaton	5
				Mat muhly	5
				Rush	5
Zinzer:					
56	Salt flats	Favorable	1,200	Alkali sacaton	30
		Normal	900	Western wheatgrass	25
		Unfavorable	600	Rubber rabbitbrush	15
				Blue grama	5
				Inland saltgrass	5
				Black greasewood	5
				Creeping wildrye	10
57	Salt flats	Favorable	1,500	Alkali sacaton	35
		Normal	1,200	Inland saltgrass	15
		Unfavorable	900	Black greasewood	15
				Rubber rabbitbrush	10
				Alkali cordgrass	5
				Rush	5
				Creeping wildrye	5

This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole unit.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Soil name and map symbol	Ordination symbol	Management concerns					Potential productivity	
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Important trees	Site index
Aquic Ustorthents:								
[1]3----------	6w	Slight	Slight	Slight	Slight	Slight	Narrowleaf cottonwood----------	65
Bushvalley:								
7----------	6d	Moderate	Moderate	Moderate	Moderate	Moderate	Ponderosa pine------	55
[1]8:								
Bushvalley part-	6d	Moderate	Moderate	Moderate	Moderate	Moderate	Ponderosa pine------	55
Youga part.								
Quamon:								
[1]43:								
Quamon part-----	6w	Slight	Slight	Slight	Slight	Slight	Narrowleaf cottonwood----------	65
LaJara part.								
Seitz:								
47----------	5x	Moderate	Severe	Moderate	Slight	Slight	Engelmann spruce----	50
Shawa loam, wet:								
50----------	6w	Slight	Slight	Slight	Slight	Slight	Narrowleaf cottonwood----------	65

[1] This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole unit.

TABLE 8.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Acacio:					
1	Slight	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.
Alamosa:					
2	Severe: wetness, floods.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: wetness, floods, frost action.
Aquic Ustorthents:					
3	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.
Aquolls:					
4:					
Aquolls part	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness, frost action.
Aquents part	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness, frost action.
Arena:					
5	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, frost action, floods.
6	Moderate: cemented pan, wetness.	Moderate: low strength, cemented pan, shrink-swell.	Moderate: cemented pan, wetness, shrink-swell.	Moderate: low strength, cemented pan, shrink-swell.	Severe: frost action.
Bushvalley:					
7	Severe: slope, depth to rock, large stones.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.
8:					
Bushvalley part	Severe: depth to rock, large stones, area reclaim.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.
Youga part	Moderate: slope, depth to rock, too clayey.	Moderate: slope, shrink-swell, low strength.	Moderate: slope, depth to rock, shrink-swell.	Severe: slope.	Severe: low strength.
Corlett:					
9:					
Corlett part	Severe: too sandy, cutbanks cave.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Slight.
Hooper part	Severe: too clayey.	Moderate: shrink-swell.	Severe: shrink-swell.	Moderate: shrink-swell.	Severe: shrink-swell, low strength.

See footnote at end of table.

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Cryaquolls:					
[1]10:					
Cryaquolls part--	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, frost action, floods.
Histosols part---	Severe: floods, wetness, excess humus.	Severe: floods, wetness, excess humus.	Severe: floods, wetness, excess humus.	Severe: floods, wetness, excess humus.	Severe: floods, wetness, excess humus.
Cumbres:					
11----------	Severe: depth to rock, large stones.	Severe: large stones.	Severe: depth to rock, large stones.	Severe: large stones.	Severe: large stones.
Derrick:					
12, 13----------	Severe: cutbanks cave, small stones.	Slight----------	Slight----------	Slight----------	Moderate: low strength.
Dunul:					
14----------	Severe: cutbanks cave, small stones.	Slight----------	Slight----------	Slight----------	Slight.
[1]15:					
Dunul part-------	Severe: cutbanks cave, small stones.	Slight----------	Slight----------	Slight----------	Slight.
Lamanga part-----	Severe: wetness.	Moderate: wetness, low strength.	Severe: wetness.	Moderate: wetness, low strength.	Severe: frost action.
Empedrado:					
[1]16:					
Empedrado part---	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Curecanti part---	Severe: small stones, slope, cutbanks cave.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Garita:					
17----------	Severe: small stones.	Moderate: large stones.	Moderate: large stones.	Moderate: large stones.	Moderate: large stones.
18----------	Severe: small stones.	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: slope.	Moderate: slope, large stones.
Graypoint:					
19, 20----------	Severe: cutbanks cave.	Slight----------	Slight----------	Slight----------	Moderate: frost action.
21----------	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: frost action, wetness.
Hooper:					
22, 23----------	Severe: too clayey.	Moderate: shrink-swell.	Severe: shrink-swell.	Moderate: shrink-swell.	Severe: shrink-swell, low strength.
Jerry:					
24----------	Moderate: small stones, too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.

See footnote at end of table.

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
LaJara:					
25	Severe: floods, wetness.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: floods, wetness.	Severe: wetness, floods, frost action.
Lamanga:					
26	Severe: wetness.	Moderate: wetness, low strength.	Severe: wetness.	Moderate: wetness, low strength.	Severe: frost action.
LaSauses:					
27	Severe: wetness, too clayey.	Severe: wetness, shrink-swell, floods.	Severe: wetness, shrink-swell, floods.	Severe: wetness, floods, shrink-swell.	Severe: wetness, low strength, shrink-swell.
Luhon:					
28	Moderate: too clayey.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.
29	Moderate: too clayey.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength, slope.	Moderate: low strength.
McGinty:					
30	Moderate: wetness, cutbanks cave.	Slight	Moderate: wetness.	Slight	Moderate: frost action.
31	Slight	Slight	Slight	Slight	Slight.
32	Slight	Slight	Slight	Moderate: slope.	Slight.
Miracle:					
33	Severe: depth to rock.	Moderate: depth to rock, shrink-swell.	Severe: depth to rock.	Moderate: depth to rock, slope, shrink-swell.	Moderate: depth to rock, frost action, shrink-swell.
Mishak:					
34	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action, wetness, low strength.
35	Moderate: wetness.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, wetness, low strength.	Moderate: shrink-swell, low strength.	Severe: frost action, low strength.
Mogote:					
36	Moderate: wetness, floods, cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: frost action.
Monte:					
37, 38	Slight	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.
Mosca:					
39	Severe: cutbanks cave, too sandy.	Slight	Slight	Slight	Slight.
40	Severe: wetness, cutbanks cave.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Severe: wetness, frost action.

See footnote at end of table.

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Nortonville:					
41	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: wetness, floods.	Severe: floods, frost action.
Platoro:					
42	Severe: cutbanks cave, small stones.	Slight	Slight	Slight	Slight.
Quamon:					
43:					
Quamon part	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Moderate: frost action.
LaJara part	Severe: floods, wetness.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: floods, wetness.	Severe: wetness, floods, frost action.
Ryan Park:					
44	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength.
San Arcacio:					
45	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, low strength.
46	Severe: wetness, cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.
Seitz:					
47	Severe: large stones, too clayey, slope.	Severe: large stones, slope.	Severe: slope, large stones.	Severe: large stones, slope.	Severe: large stones, slope.
Shawa:					
48, 49	Slight	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength, frost action.
50	Severe: wetness, floods.	Severe: floods.	Severe: wetness, floods.	Severe: floods.	Severe: floods, frost action.
Space City:					
51	Severe: cutbanks cave.	Slight	Slight	Slight	Slight.
Stunner:					
52	Slight	Moderate: low strength.	Moderate: low strength, shrink-swell.	Moderate: low strength.	Moderate: low strength, shrink-swell.
Travelers:					
53	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
54	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.
Vastine:					
55	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods, frost action.

See footnote at end of table.

TABLE 6.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Zinzer:					
56	Slight	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.
57	Severe: wetness.	Moderate: low strength, wetness, shrink-swell.	Severe: wetness.	Moderate: low strength, wetness, shrink-swell.	Severe: frost action, low strength.

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole unit.

TABLE 9.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," and "fair." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Acacio:					
1	Slight	Moderate: seepage.	Slight	Slight	Good.
Alamosa:					
2	Severe: wetness, floods, percs slowly.	Severe: wetness, floods, seepage.	Severe: wetness, floods, seepage.	Severe: wetness, floods, seepage.	Poor: wetness.
Aquic Ustorthents:					
3	Severe: floods, wetness.	Severe: floods, wetness, seepage.	Severe: floods, wetness, seepage.	Severe: floods, wetness, seepage.	Poor: wetness, seepage.
Aquolls:					
[1]4:					
Aquolls part	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
Aquents part	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
Arena:					
5	Severe: cemented pan, floods, wetness.	Severe: wetness, cemented pan, floods.	Severe: wetness, floods, cemented pan.	Severe: wetness, floods.	Poor: wetness.
6	Severe: cemented pan, wetness, percs slowly.	Severe: cemented pan.	Severe: wetness, cemented pan.	Moderate: wetness.	Fair: thin layer, area reclaim.
Bushvalley:					
7	Severe: slope, depth to rock, percs slowly.	Severe: slope, depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: slope.	Poor: slope, thin layer, large stones.
[1]8:					
Bushvalley part	Severe: depth to rock, percs slowly.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, large stones.	Moderate slope.	Poor: thin layer, large stones, area reclaim.
Youga part	Severe: percs slowly, depth to rock.	Severe: slope.	Severe: depth to rock.	Moderate: slope.	Fair: slope, too clayey.
Corlett:					
[1]9:					
Corlett part	Moderate: wetness.	Severe: seepage.	Severe: wetness, seepage.	Severe: wetness, seepage.	Poor: too sandy.
Hooper part	Moderate: wetness.	Severe: seepage.	Severe: wetness, too clayey, seepage.	Severe: seepage.	Poor: too clayey.

See footnote at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Cryaquolls:					
[1]10:					
Cryaquolls part--	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Poor: wetness.
Histosols part---	Severe: wetness, floods.	Severe: wetness, floods, excess humus.	Severe: wetness, floods, excess humus.	Severe: floods, wetness, excess humus.	Poor: wetness, excess humus.
Cumbres:					
11----------	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock, large stones.	Slight----------	Poor: large stones.
Derrick:					
12, 13----------	Slight----------	Severe: seepage, small stones.	Severe: too sandy, small stones, seepage.	Severe: seepage.	Poor: small stones, too sandy.
Dunul:					
14----------	Slight----------	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy, small stones.
[1]15:					
Dunul part-------	Slight----------	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy, small stones.
Lamanga part-----	Severe: wetness.	Severe: wetness, seepage.	Severe: wetness, seepage.	Severe: wetness, seepage.	Good.
Empedrado:					
[1]16:					
Empedrado part---	Severe: slope.	Severe: seepage, slope.	Severe: seepage.	Severe: slope, seepage.	Poor: slope.
Curecanti part---	Severe: slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage, slope.	Poor: small stones, slope.
Garita:					
17----------	Slight----------	Severe: small stones, seepage.	Slight----------	Slight----------	Poor: small stones.
18----------	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Poor: small stones, slope.
Graypoint:					
19, 20----------	Slight----------	Severe: seepage.	Severe: too sandy, small stones, seepage.	Severe: seepage.	Poor: too sandy, small stones.
21----------	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: too sandy, small stones.
Hooper:					
22, 23----------	Moderate: wetness.	Severe: seepage.	Severe: wetness, too clayey, seepage.	Severe: seepage.	Poor: too clayey.

See footnote at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Jerry:					
24	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Moderate: slope.	Fair: too clayey, small stones, slope.
LaJara:					
25	Severe: wetness, floods.	Severe: wetness, seepage, floods.	Severe: wetness, floods, seepage.	Severe: wetness, floods, seepage.	Poor: wetness.
Lamanga:					
26	Severe: wetness.	Severe: wetness, seepage.	Severe: wetness, seepage.	Severe: wetness, seepage.	Good.
LaSauses:					
27	Severe: percs slowly, wetness.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: wetness, too clayey.
Luhon:					
28, 29	Moderate: percs slowly	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
McGinty:					
30	Moderate: wetness.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
31, 32	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: area reclaim, small stones.
Miracle:					
33	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Fair: thin layer, area reclaim.
Mishak:					
34	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
35	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: area reclaim, wetness.
Mogote:					
36	Severe: wetness.	Severe: wetness, seepage.	Severe: wetness, seepage.	Moderate: wetness, floods.	Good.
Monte:					
37	Slight	Moderate: seepage.	Slight	Slight	Good.
38	Slight	Moderate: seepage, slope.	Slight	Slight	Good.
Mosca:					
39	Slight	Severe: seepage.	Severe: too sandy, seepage.	Severe: seepage.	Poor: too sandy.
40	Severe: wetness.	Severe: wetness, seepage.	Severe: wetness, seepage, too sandy.	Severe: wetness, seepage.	Poor: wetness, area reclaim, too sandy.

See footnote at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Nortonville: 41	Severe: wetness, percs slowly, floods.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
Platoro: 42	Slight	Severe: seepage, small stones.	Severe: small stones, seepage.	Severe: seepage.	Fair: small stones.
Quamon: 43: Quamon part	Severe: wetness.	Severe: seepage.	Severe: wetness, seepage.	Severe: seepage.	Poor: too sandy, small stones.
LaJara part	Severe: wetness, floods.	Severe: wetness, seepage, floods.	Severe: wetness, floods, seepage.	Severe: wetness, floods, seepage.	Poor: wetness.
Ryan Park: 44	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
San Arcacio: 45	Severe: wetness.	Severe: seepage, wetness.	Severe: wetness, seepage.	Severe: wetness, seepage.	Poor: area reclaim, small stones.
46	Severe: wetness.	Severe: wetness, seepage.	Severe: wetness, seepage.	Severe: wetness, seepage.	Poor: wetness, area reclaim, small stones.
Seitz: 47	Severe: percs slowly, large stones, slope.	Severe: slope, large stones.	Severe: slope, large stones, too clayey.	Severe: slope.	Poor: slope, large stones.
Shawa: 48	Moderate: percs slowly.	Moderate: seepage.	Slight	Slight	Good.
49	Moderate: percs slowly.	Moderate: slope, seepage.	Slight	Slight	Good.
50	Severe: wetness, floods.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
Space City: 51	Slight	Severe: seepage.	Severe: too sandy, seepage.	Severe: seepage.	Fair: too sandy.
Stunner: 52	Slight	Moderate: seepage.	Slight	Slight	Good.
Travelers: 53	Severe: depth to rock.	Severe: depth to rock, large stones.	Severe: depth to rock.	Slight	Poor: thin layer, large stones, area reclaim.

See footnote at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Travelers:					
54	Severe: depth to rock.	Severe: slope, depth to rock, large stones.	Severe: depth to rock.	Moderate: slope.	Poor: thin layer, large stones, area reclaim.
Vastine:					
55	Severe: wetness, floods.	Severe: floods, wetness, seepage.	Severe: floods, wetness, seepage.	Severe: floods, wetness, seepage.	Poor: wetness.
Zinzer:					
56	Moderate: perco slowly.	Moderate: seepage.	Slight	Slight	Good.
57	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: area reclaim, wetness.

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole unit.

TABLE 10.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and "poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Acacio:				
1	Fair: low strength.	Unsuited	Unsuited	Fair: excess salt, excess sodium.
Alamosa:				
2	Poor: wetness, frost action.	Unsuited	Unsuited	Poor: wetness.
Aquic Ustorthents:				
[1]3	Poor: wetness, area reclaim.			
Aquolls:				
[1]4:				
Aquolls part	Poor: frost action, wetness.			Poor: wetness.
Aquents part	Poor: frost action, wetness.			Poor: wetness.
Arena:				
5	Poor: wetness, frost action, thin layer.	Unsuited	Unsuited	Poor: excess salt, wetness.
6	Poor: thin layer, area reclaim, frost action.	Unsuited	Unsuited	Poor: excess sodium, excess salt, area reclaim.
Bushvalley:				
7	Poor: slope, thin layer, area reclaim.	Unsuited	Unsuited	Poor: slope, large stones, area reclaim.
[1]8:				
Bushvalley part	Poor: thin layer, area reclaim.	Unsuited	Unsuited	Poor: large stones, area reclaim.
Youga part	Poor: low strength.	Unsuited	Unsuited	Fair: slope, thin layer, small stones.
Corlett:				
[1]9:				
Corlett part	Good	Fair: excess fines.	Unsuited	Poor: too sandy, excess sodium.
Hooper part	Good	Fair: excess fines.	Unsuited	Poor: excess sodium.
Cryaquolls:				
[1]10:				
Cryaquolls part	Poor: wetness, frost action.			Poor: wetness.

See footnote at end of table.

TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Cryaquolls: Histosols part	Poor: wetness, excess humus, frost action.	Good	Unsuited	Poor: wetness, excess humus.
Cumbres: 11	Poor: thin layer, large stones, area reclaim.	Unsuited	Unsuited	Poor: large stones.
Derrick: 12, 13	Good	Good	Good	Poor: small stones.
Dunul: 14	Poor: large stones.	Poor: excess fines.	Poor: excess fines.	Poor: too sandy, small stones, large stones.
15: Dunul part	Poor: large stones.	Poor: excess fines.	Poor: excess fines.	Poor: too sandy, small stones, large stones.
Lamanga part	Poor: frost action.	Unsuited	Unsuited	Fair: too clayey, excess salt.
Empedrado: 16: Empedrado part	Fair: slope, frost action.	Poor: excess fines.	Unsuited	Poor: slope.
Curecanti part	Fair: frost action, slope.	Poor: excess fines.	Poor: excess fines.	Poor: small stones, slope.
Garita: 17	Good	Poor: excess fines.	Poor: excess fines.	Poor: small stones.
18	Good	Poor: excess fines.	Poor: excess fines.	Poor: small stones, slope.
Graypoint: 19, 20	Fair: frost action.	Good	Good	Poor: small stones.
21	Fair: wetness, frost action.	Good	Good	Poor: small stones.
Hooper: 22, 23	Good	Fair: excess fines.	Unsuited	Poor: excess sodium.
Jerry: 24	Poor: shrink-swell, low strength.	Unsuited	Unsuited	Fair: thin layer, slope.
LaJara: 25	Poor: frost action, wetness.	Poor: excess fines.	Unsuited	Poor: wetness.

See footnote at end of table.

TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Lamanga:				
26	Poor: frost action.	Unsuited	Unsuited	Fair: too clayey, excess salt.
LaSauses:				
27	Poor: low strength, shrink-swell, wetness.	Unsuited	Unsuited	Poor: excess sodium, excess salt, wetness.
Luhon:				
28, 29	Fair: low strength.	Unsuited	Unsuited	Fair: small stones.
McGinty:				
30	Fair: frost action.	Poor: excess fines.	Unsuited	Fair: excess salt, area reclaim
31, 32	Fair: area reclaim, frost action.	Unsuited	Unsuited	Fair: area reclaim, small stones.
Miracle:				
33	Poor: thin layer, area reclaim.	Unsuited	Unsuited	Fair: too clayey.
Mishak:				
34	Poor: frost action, wetness.	Unsuited	Unsuited	Poor: excess salt.
35	Poor: frost action.	Unsuited	Unsuited	Fair: excess sodium, area reclaim.
Mogote:				
36	Poor: frost action.	Good	Good	Fair: too clayey.
Monte:				
37, 38	Fair: low strength.	Unsuited	Unsuited	Good.
Mosca:				
39	Good	Good	Poor: excess fines.	Poor: too sandy, excess sodium.
40	Poor: wetness, frost action, area reclaim.	Fair: excess fines.	Poor: excess fines.	Poor: wetness, excess sodium, too sandy.
Nortonville:				
41	Poor: frost action.	Unsuited	Unsuited	Poor: excess sodium, excess salt, wetness.
Platoro:				
42	Good	Fair: excess fines.	Fair: excess fines.	Good.
Quamon:				
43:				
Quamon part	Fair: frost action.	Fair: excess fines.	Fair: excess fines.	Poor: small stones.

See footnote at end of table.

TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Quamon:				
LaJara part	Poor: frost action, wetness.	Poor: excess fines.	Unsuited	Poor: wetness.
Ryan Park:				
44	Fair: low strength.	Poor: excess fines.	Unsuited	Fair: small stones.
San Arcacio:				
45	Good	Good	Good	Fair: small stones, area reclaim.
46	Poor: wetness, frost action.	Good	Good	Poor: wetness, excess sodium, area reclaim.
Seitz:				
47	Poor: slope, large stones.	Unsuited	Unsuited	Poor: slope, large stones.
Shawa:				
48, 49	Fair: low strengtn, frost action.	Unsuited	Unsuited	Good.
50	Poor: frost action.	Unsuited	Unsuited	Fair: excess sodium.
Space City:				
51	Good	Poor: excess fines.	Unsuited	Poor: too sandy.
Stunner:				
52	Fair: low strength.	Unsuited	Unsuited	Fair: too clayey.
Travelers:				
53, 54	Poor: thin layer.	Unsuited	Unsuited	Poor: large stones, small stones.
Vastine:				
55	Poor: wetness, frost action.	Poor: excess fines.	Unsuited	Poor: wetness.
Zinzer:				
56	Poor: low strength.	Unsuited	Unsuited	Fair: excess salt.
57	Poor: frost action, low strength.	Unsuited	Unsuited	Poor: excess sodium, area reclaim.

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole unit.

TABLE 11.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Acacio:							
1	Seepage	Piping, low strength.	Deep to water	Excess salt, excess sodium.	Excess salt, erodes easily, excess sodium.	Piping	Excess salt, excess sodium.
Alamosa:							
2	Seepage, excess humus.	Low strength, compressible, piping.	Favorable	Floods, poor outlets, wetness.	Wetness, floods.	Wetness, piping.	Wetness.
Aquic Ustorthents:							
[1]3			Favorable	Floods, poor outlets, wetness.	Wetness, floods.	Wetness	Wetness.
Aquolls:							
[1]4:							
Aquolls part			Favorable	Poor outlets, frost action, floods.	Floods, wetness.	Poor outlets, wetness.	Wetness.
Aquents part			Favorable	Poor outlets, frost action, floods.	Floods, wetness.	Poor outlets, wetness.	Wetness.
Arena:							
5	Cemented pan	Low strength, thin layer.	Favorable	Excess salt, cemented pan.	Excess salt, wetness, rooting depth.	Wetness, cemented pan.	Excess salt, rooting depth.
6	Cemented pan	Low strength, thin layer.	Slow refill	Cemented pan, excess sodium, poor outlets.	Cemented pan, excess sodium, percs slowly.	Cemented pan	Excess sodium, rooting depth.
Bushvalley:							
7	Depth to rock, slope.	Thin layer, large stones.	No water			Depth to rock, slope, rooting depth.	Slope, rooting depth, large stones.
[1]8:							
Bushvalley part	Depth to rock, slope.	Thin layer, large stones.	No water			Depth to rock, slope, rooting depth.	Slope, rooting depth, large stones.
Youga part	Depth to rock, slope.	Low strength, shrink-swell, compressible.	No water			Slope, percs slowly.	Slope, percs slowly.
Corlett:							
[1]9:							
Corlett part	Slope, seepage.	Piping, erodes easily, seepage.	Favorable			Complex slope, erodes easily, piping.	Excess sodium, slope, erodes easily.
Hooper part	Favorable	Compressible, hard to pack.	Percs slowly	Favorable	Excess sodium, percs slowly.	Percs slowly	Excess sodium.
Cryaquolls:							
[1]10:							
Cryaquolls part			Favorable	Floods, wetness.	Floods, wetness.	Wetness	Wetness.
Histosols part	Seepage	Excess humus, unstable fill.	Favorable			Wetness	Wetness.

See footnote at end of table.

TABLE 11.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Cumbres:							
11	Depth to rock, slope.	Large stones, hard to pack, thin layer.	No water			Depth to rock, large stones.	Large stones, rooting depth, slope.
Derrick:							
12	Seepage	Piping, seepage.	No water	Favorable	Cutbanks cave	Piping	Droughty.
13	Seepage	Piping, seepage.	No water	Slope	Slope, cutbanks cave.	Piping	Droughty.
Dunul:							
14	Seepage	Seepage, erodes easily, piping.	Deep to water	Cutbanks cave	Fast intake, droughty.	Too sandy, erodes easily, piping.	Droughty.
15:							
Dunul part	Seepage	Seepage, erodes easily, piping.	Deep to water	Cutbanks cave	Fast intake, droughty.	Too sandy, erodes easily, piping.	Droughty.
Lamanga part	Seepage	Low strength, piping.	Favorable	Poor outlets, frost action.	Excess salt, wetness.	Wetness, poor outlets, piping.	Excess salt, wetness.
Empedrado:							
16:							
Empedrado part	Slope, seepage.	Piping, low strength.	No water			Slope, piping.	Slope.
Curecanti part	Slope, seepage.	Seepage, piping.	No water			Slope, piping.	Slope, droughty.
Garita:							
17	Seepage, slope.	Piping	No water	Favorable	Fast intake, droughty.	Large stones, erodes easily, piping.	Large stones, droughty.
18	Seepage, slope.	Piping	No water	Slope	Fast intake, droughty, slope.	Slope, piping.	Slope, droughty.
Graypoint:							
19	Seepage	Seepage, piping.	No water	Favorable	Droughty	Piping	Droughty.
20	Slope, seepage.	Seepage, piping.	No water	Slope	Slope, droughty.	Piping	Droughty.
21	Seepage	Seepage, piping.	Favorable	Wetness, poor outlets.	Droughty, wetness.	Piping	Droughty.
Hooper:							
22, 23	Favorable	Compressible, hard to pack.	Favorable	Favorable	Excess sodium, percs slowly.	Percs slowly	Excess sodium.
Jerry:							
24	Slope	Low strength, shrink-swell, hard to pack.	No water			Slope, percs slowly.	Slope, percs slowly.
LaJara:							
25	Seepage	Piping	Favorable	Floods, poor outlets, wetness.	Wetness, floods.	Piping, poor outlets, wetness.	Wetness.
Lamanga:							
26	Seepage	Low strength, piping.	Favorable	Poor outlets, frost action.	Excess salt, wetness.	Wetness, poor outlets, piping.	Excess salt, wetness.

See footnote at end of table.

TABLE 11.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
LaSauses:							
27	Favorable	Shrink-swell, compressible, low strength.	Slow refill	Poor outlets, excess sodium, excess salt.	Excess sodium, percs slowly, wetness.	Poor outlets, percs slowly, wetness.	Excess sodium, percs slowly, wetness.
Luhon:							
28	Slope, seepage.	Piping, low strength, hard to pack.	No water	Slope, excess salt, percs slowly.	Slope, excess sodium, excess salt.	Percs slowly	Excess sodium, excess salt.
29	Slope, seepage.	Piping, low strength, hard to pack.	No water	Slope, excess salt, percs slowly.	Slope, excess sodium, excess salt.	Percs slowly	Slope, excess sodium, excess salt.
McGinty:							
30	Seepage	Piping	Deep to water	Cutbanks cave	Fast intake, droughty.	Erodes easily, piping.	Excess salt, droughty.
31, 32	Seepage	Hard to pack, piping.	No water	Slope	Slope, fast intake, droughty.	Piping, droughty, erodes easily.	
Miracle:							
33	Depth to rock, slope.	Thin layer, low strengtn.	No water			Depth to rock, erodes easily, slope.	Slope, erodes easily.
Mishak:							
34	Seepage	Low strength	Favorable	Wetness, excess salt.	Excess salt, wetness.	Wetness	Excess salt, wetness.
35	Seepage	Low strength, erodes easily.	Favorable	Excess sodium, frost action, poor outlets.	Excess sodium	Poor outlets	
Mogote:							
36	Seepage	Low strength	Favorable	Poor outlets, cutbanks cave, frost action.	Excess salt, wetness.	Wetness	Excess salt, wetness.
Monte:							
37, 38	Seepage	Low strength, erodes easily, piping.	No water	Favorable	Favorable	Erodes easily, piping.	
Mosca:							
39	Seepage	Piping, seepage.	No water	Favorable	Excess sodium, erodes easily, droughty.	Piping, erodes easily.	
40	Seepage	Seepage, piping.	Cutbanks cave, salty water.	Cutbanks cave, poor outlets, frost action.	Excess sodium, wetness, seepage.	Wetness, erodes easily, poor outlets.	
Nortonville:							
41	Favorable	Low strength	Favorable	Frost action, poor outlets, excess sodium.	Excess sodium, wetness, percs slowly.	Poor outlets, percs slowly, wetness.	Excess sodium, percs slowly, wetness.
Platoro:							
42	Seepage	Seepage, piping.	No water	Favorable	Droughty	Piping	
Quamon:							
43:							
Quamon part	Seepage	Seepage	Favorable	Favorable	Droughty, seepage.	Favorable	Droughty.
LaJara part	Seepage	Piping	Favorable	Floods, poor outlets, wetness.	Wetness, floods.	Piping, poor outlets, wetness.	Wetness.

See footnote at end of table.

TABLE 11.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Ryan Park:							
44	Slope, seepage.	Low strength, piping.	No water	Slope	Slope, droughty.	Piping, soil blowing.	Droughty, soil blowing.
San Arcacio:							
45	Seepage	Seepage, piping.	Favorable	Poor outlets	Droughty	Piping	Droughty.
46	Seepage	Seepage, piping.	Favorable	Poor outlets, frost action, wetness.	Excess sodium, wetness.	Piping, poor outlets, erodes easily.	Excess sodium, wetness.
Seitz:							
47	Slope	Large stones, hard to pack.	No water			Large stones, slope.	Large stones, slope.
Shawa:							
48	Seepage	Low strength, piping.	Deep to water	Poor outlets	Favorable	Piping	Favorable.
49	Slope, seepage.	Low strength, piping.	Deep to water	Slope, poor outlets.	Slope	Piping	Favorable.
50	Seepage	Low strength, piping, hard to pack.	Favorable	Poor outlets, frost action, floods.	Wetness, floods, excess sodium.	Poor outlets, wetness.	Wetness, excess sodium.
Space City:							
51	Slope, seepage.	Piping, erodes easily, seepage.	No water	Slope	Slope, erodes easily, fast intake.	Too sandy, erodes easily, droughty.	
Stunner:							
52	Seepage	Low strength, piping.	No water	Favorable	Favorable	Piping	Favorable.
Travelers:							
53	Depth to rock	Thin layer, large stones, piping.	No water			Large stones, depth to rock.	Large stones, rooting depth.
54	Depth to rock, slope.	Thin layer, large stones, piping.	No water			Slope, large stones, deptn to rock.	Slope, large stones, rooting depth.
Vastine:							
55	Seepage	Piping, hard to pack, low strength.	Favorable	Floods, frost action, poor outlets.	Wetness, floods.	Poor outlets, wetness.	Wetness.
Zinzer:							
56	Seepage	Favorable	Deep to water	Favorable	Excess salt	Poor outlets	
57	Seepage	Shrink-swell, low strength, piping.	Salty water	Poor outlets, frost action.	Excess sodium, wetness.	Wetness, erodes easily, poor outlets.	

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole unit.

TABLE 12.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Acacio:				
1	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.
Alamosa:				
2	Severe: floods, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Aquic Ustorthents:				
3	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.
Aquolls:				
4:				
Aquolls part	Severe: floods, wetness.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness.
Aquents part	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: wetness.
Arena:				
5	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness.
6	Moderate: percs slowly, dusty.	Moderate: dusty.	Moderate: cemented pan, percs slowly, dusty.	Moderate: dusty.
Bushvalley:				
7	Severe: slope.	Severe: slope.	Severe: slope, large stones, depth to rock.	Severe: slope.
8:				
Bushvalley part	Moderate: slope, small stones, large stones.	Moderate: slope, small stones.	Severe: slope, large stones, depth to rock.	Moderate: small stones, large stones.
Youga part	Moderate: slope, percs slowly.	Moderate: slope.	Severe: slope.	Slight.
Corlett:				
9:				
Corlett part	Severe: too sandy, dusty.	Severe: too sandy, dusty.	Severe: too sandy, dusty.	Severe: too sandy, dusty.
Hooper part	Moderate: too sandy, percs slowly.	Moderate: too sandy.	Moderate: too sandy, percs slowly.	Moderate: too sandy.
Cryaquolls:				
10:				
Cryaquolls part	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.

See footnote at end of table.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Cryaquolls:				
Histosols part	Severe: floods, wetness, excess humus.	Severe: wetness, floods, excess humus.	Severe: floods, wetness, excess humus.	Severe: floods, wetness, excess humus.
Cumbres:				
11	Moderate: large stones, slope.	Slight	Severe: large stones.	Slight.
Derrick:				
12, 13	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Moderate: small stones.
Dunul:				
14	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Moderate: small stones.
[1]15:				
Dunul part	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Moderate: small stones.
Lamanga part	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Slight.
Empedrado:				
[1]16:				
Empedrado part	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
Curecanti part	Severe: slope.	Severe: slope.	Severe: small stones.	Moderate: small stones, slope.
Garita:				
17	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Moderate: small stones.
18	Moderate: small stones, slope.	Moderate: small stones, slope.	Severe: small stones, slope.	Moderate: small stones.
Graypoint:				
19, 20	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Moderate: small stones.
21	Severe: wetness.	Moderate: wetness.	Severe: small stones, wetness.	Moderate: wetness.
Hooper:				
22	Moderate: percs slowly, too clayey, dusty.	Moderate: too clayey, dusty.	Moderate: percs slowly, dusty, too clayey.	Moderate: too clayey, dusty.
23	Moderate: too sandy, percs slowly.	Moderate: too sandy.	Moderate: too sandy, percs slowly.	Moderate: too sandy.
Jerry:				
24	Moderate: slope, percs slowly.	Moderate: slope.	Severe: slope.	Slight.
LaJara:				
25	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness.

See footnote at end of table.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Lamanga:				
26	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Slight.
LaSauses:				
27	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, percs slowly.	Severe: wetness.
Luhon:				
28	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.
29	Moderate: dusty.	Moderate: dusty.	Severe: slope.	Moderate: dusty.
McGinty:				
30	Slight	Slight	Slight	Slight.
31	Slight	Slight	Moderate: slope, small stones.	Slight.
32	Slight	Slight	Severe: slope.	Slight.
Miracle:				
33	Slight	Slight	Severe: slope.	Slight.
Mishak:				
34	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
35	Slight	Slight	Slight	Slight.
Mogote:				
36	Severe: floods.	Moderate: wetness, floods.	Severe: floods.	Slight.
Monte:				
37	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Slight.
38	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Slight.
Mosca:				
39	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.
40	Moderate: too sandy, wetness.	Moderate: too sandy, wetness.	Moderate: too sandy, wetness.	Moderate: too sandy, wetness.
Nortonville:				
41	Severe: floods, wetness.	Moderate: floods, wetness.	Severe: wetness, floods.	Moderate: floods, wetness.
Platoro:				
42	Slight	Slight	Slight	Slight.
Quamon:				
143:				
Quamon part	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Moderate: small stones.

See footnote at end of table.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Quamon:				
LaJara part	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness.
Ryan Park:				
44	Slight	Slight	Moderate: slope.	Slight.
San Arcacio:				
45	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.
46	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Seitz:				
47	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.
Shawa:				
48	Slight	Slight	Slight	Slight.
49	Slight	Slight	Moderate: slope.	Slight.
50	Severe: floods.	Moderate: floods, wetness.	Moderate: floods, wetness.	Slight.
Space City:				
51	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.
Stunner:				
52	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.
Travelers:				
53	Severe: small stones.	Severe: small stones.	Severe: depth to rock, small stones.	Severe: small stones.
54	Severe: small stones.	Severe: small stones.	Severe: depth to rock, slope, small stones.	Severe: small stones.
Vastine:				
55	Severe: wetness, floods, percs slowly.	Severe: floods, wetness.	Severe: floods, wetness, percs slowly.	Severe: wetness, floods.
Zinzer:				
56	Slight	Slight	Slight	Slight.
57	Moderate: wetness.	Slight	Moderate: wetness.	Slight.

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole unit.

TABLE 13.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates the soil was not rated]

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
Acacio:												
1	Fair	Fair	---	---	---	Poor	Poor	Very poor.	Fair	---	Poor	---
Alamosa:												
2	Fair	Good	---	---	---	---	Good	Good	Fair	---	Good	---
Aquic Ustorthents:												
[1]3	Very poor.	Very poor.	Poor	Fair	---	Poor	Good	Good	Poor	Poor	Good	Very poor.
Aquolls:												
[1]4:												
Aquolls part	Very poor.	Very poor.	Fair	---	---	Good	Fair	Fair	Fair	---	Fair	Fair.
Aquents part	Very poor.	Very poor.	Fair	---	---	Good	Fair	Fair	Fair	---	Fair	Fair.
Arena:												
5	Fair	Fair	Fair	---	---	Fair	Fair	Good	Fair	---	Fair	Fair.
6	Poor	Poor	Poor	---	---	Fair	Fair	Fair	Poor	---	Fair	Poor.
Bushvalley:												
7	Very poor.	Very poor.	Poor	---	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Poor.
[1]8:												
Bushvalley part	Very poor.	Very poor.	Poor	---	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Poor.
Youga part	Poor	Poor	Good	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
Corlett:												
[1]9:												
Corlett part	Very poor.	Very poor.	Poor	---	---	Fair	Very poor.	Very poor.	Very poor.	---	Very poor.	Poor.
Hooper part	Very poor.	Poor	Poor	---	---	Fair	Fair	Fair	Poor	---	Fair	Poor.
Cryaquolls:												
[1]10:												
Cryaquolls part	Poor	Poor	Fair	---	---	Fair	Good	Good	Poor	---	Good	Fair.
Histosols part	Very poor.	Very poor.	Fair	---	---	Poor	Good	Good	Poor	---	Good	Poor.
Cumbres:												
11	Very poor.	Very poor.	Fair	---	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Derrick:												
12, 13	Poor	Poor	Good	---	---	Good	Poor	Very poor.	Poor	---	Very poor.	Good.
Dunul:												
14	Poor	Poor	---	---	---	---	Very poor.	Very poor.	Poor	---	Very poor.	---
[1]15:												
Dunul part	Very poor.	Very poor.	Poor	---	---	Poor	Very poor.	Very poor.	Very poor.	---	Very poor.	Poor.

See footnote at end of table.

TABLE 13.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
Dunul:												
Lamanga part----	Poor	Poor	Good	---	---	Good	Good	Fair	Poor	---	Fair	Good.
Empedrado:												
116:												
Empedrado part--	Poor	Poor	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
Curecanti part--	Poor	Poor	Fair	---	---	Fair	Poor	Very poor.	Poor	---	Very poor.	Fair.
Garita:												
17, 18----------	Very poor.	Very poor.	Poor	---	---	Poor	Very poor.	Very poor.	Poor	---	Very poor.	Poor.
Graypoint:												
19, 20----------	Poor	Poor	---	---	---	---	Very poor.	Very poor.	Fair	---	Very poor.	---
21----------	Poor	Poor	Fair	---	---	Fair	Good	Good	Fair	---	Good	Fair.
Hooper:												
22----------	Very poor.	Very poor.	Very poor.	---	---	Poor	Fair	Fair	Very poor.	---	Fair	Very poor.
23----------	Very poor.	Poor	Poor	---	---	Fair	Fair	Fair	Poor	---	Fair	Poor.
Jerry:												
24----------	Poor	Poor	Good	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
LaJara:												
25----------	Poor	Fair	Good	Fair	---	Fair	Good	Good	Poor	Fair	Good	Fair.
Lamanga:												
26----------	Poor	Poor	Good	---	---	Good	Good	Fair	Poor	---	Fair	Good.
LaSauses:												
27----------	Poor	Fair	---	---	---	---	Fair	Good	Fair	---	Fair	---
Luhon:												
28----------	Fair	Fair	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
29----------	Poor	Poor	Fair	---	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
McGinty:												
30----------	Fair	Fair	---	---	---	Good	Very poor.	Very poor.	Fair	---	Very poor.	---
31----------	Fair	Fair	Fair	---	---	Poor	Very poor.	Very poor.	Fair	---	Very poor.	---
32----------	Very poor.	Very poor.	Poor	---	---	Poor	Very poor.	Very poor.	Very poor.	---	Very poor.	Poor.
Miracle:												
33----------	Poor	Poor	Good	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
Mishak:												
34----------	Poor	Poor	Fair	---	---	Fair	Fair	Good	Poor	---	Fair	Fair.
35----------	Fair	Fair	Fair	---	---	Fair	Fair	Fair	Fair	---	Fair	---
Mogote:												
36----------	Poor	Poor	Good	---	---	Good	Fair	Fair	Poor	---	Fair	Good.

See footnote at end of table.

TABLE 13.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
Monte:												
37, 38	Fair	Fair	---	---	---	---	Very poor.	Very poor.	Good	---	Very poor.	---
Mosca:												
39	Very poor.	Very poor.	Poor	---	---	Poor	Poor	Very poor.	Very poor.	---	Very poor.	Poor.
40	Fair	Fair	Fair	---	---	Fair	Fair	Good	Fair	---	Fair	---
Nortonville:												
41	Poor	Poor	Fair	---	---	Fair	Fair	Good	Poor	---	Fair	Fair.
Platoro:												
42	Fair	Fair	---	---	---	---	Very poor.	Very poor.	Fair	---	Very poor.	---
Quamon:												
[1]43:												
Quamon part	Very poor.	Very poor.	Fair	Fair	---	Fair	Fair	Fair	Poor	Fair	Fair	Fair.
LaJara part	Poor	Fair	Good	Fair	---	Fair	Good	Good	Poor	Fair	Good	Fair.
Ryan Park:												
44	Poor	Fair	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
San Arcacio:												
45	Fair	Fair	---	---	---	---	Poor	Poor	Fair	---	Poor	---
46	Fair	Fair	Fair	---	---	Fair	Fair	Good	Fair	---	Fair	---
Seitz:												
47	Very poor.	Very poor.	Good	---	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.	---
Shawa:												
48, 49	Fair	Fair	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
50	Fair	Fair	Good	---	---	Fair	Good	Good	Fair	---	Good	Fair.
Space City:												
51	Very poor.	Very poor.	Fair	---	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Stunner:												
52	Very poor.	Very poor.	Fair	---	---	Fair	Very poor.	Very poor.	Very poor.	---	Very poor.	Fair.
Travelers:												
53, 54	Very poor.	Very poor.	Fair	---	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Vastine:												
55	Fair	Fair	Good	---	---	Fair	Good	Good	Fair	---	Good	Good.
Zinzer:												
56	Fair	Fair	---	---	---	---	Poor	Very poor.	Fair	---	Very poor.	---
57	Fair	Fair	Fair	---	---	Fair	Poor	Fair	Fair	---	Poor	---

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole unit.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS

[The symbol < means less than; > means more than. Absence of an entry indicates data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Acacio:											
1	0-4	Sandy loam	SM, ML	A-4	0	90-100	75-100	50-85	35-60	25-35	NP-10
	4-14	Clay loam, loam	CL, SC	A-6	0	90-100	75-100	65-95	45-65	30-40	10-15
	14-60	Loam, sandy loam	ML, SM, CL-ML, SM-SC	A-4	0-5	85-100	75-100	60-90	35-60	25-40	5-10
Alamosa:											
2	0-6	Loam	ML	A-4, A-6	0	90-100	80-100	80-95	55-75	30-40	5-15
	6-38	Clay loam, loam	CL	A-6, A-7	0	90-100	80-100	80-100	65-80	35-50	15-30
	38-60	Loam, sandy loam, loamy sand.	ML, SM, CL-ML, SM-SC	A-4, A-2	0	85-100	75-100	50-90	15-70	15-30	NP-10
Aquic Ustorthents:											
3	0-60	Variable	---	---	---	---	---	---	---	---	---
Aquolls:											
4:											
Aquolls part	0-60	Variable	---	---	---	---	---	---	---	---	---
Aquents part	0-60	Variable	---	---	---	---	---	---	---	---	---
Arena:											
5	0-2	Loam	CL	A-6	0-5	90-100	75-100	70-90	60-70	30-40	10-20
	2-30	Clay loam	CL	A-6	0-5	90-100	75-100	70-90	60-70	30-40	10-20
	30	Indurated	---	---	---	---	---	---	---	---	---
6	0-2	Loam	CL	A-6	0-5	90-100	75-100	70-90	60-70	30-40	10-20
	2-30	Clay loam, sandy clay loam, loam.	CL	A-6	0-5	90-100	75-100	65-90	55-70	30-40	10-20
	30	Indurated	---	---	---	---	---	---	---	---	---
Bushvalley:											
7	0-4	Very stony loam	GM-GC	A-4	40-60	55-75	50-70	40-65	40-50	20-30	5-10
	4-17	Very cobbly sandy clay loam, very stony sandy clay loam, stony sandy clay loam.	SC, GC	A-2, A-6	30-55	65-85	50-70	40-60	20-40	25-35	10-15
	17	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
8:											
Bushvalley part	0-4	Very stony loam	GM-GC	A-4	40-60	55-75	50-70	40-65	40-50	20-30	5-10
	4-17	Very cobbly sandy clay loam, very stony sandy clay loam, stony sandy clay loam.	SC, GC	A-2, A-6	30-55	65-85	50-70	40-60	20-40	25-35	10-15
	17	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Youga part	0-7	Loam	CL-ML	A-4	0-20	75-95	75-90	60-80	50-60	25-30	5-10
	7-31	Clay loam	CL	A-6, A-7	0-25	75-90	75-85	65-80	55-65	30-50	10-25
	31-44	Gravelly sandy clay loam, gravelly clay loam.	SC	A-6, A-7	0-15	75-90	50-75	40-65	35-45	25-45	10-25
	44	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Corlett:											
19:											
Corlett part----	0-8	Loamy fine sand	SM	A-2	0	100	100	70-80	10-20	---	NP
	8-60	Fine sand-------	SP-SM, SM	A-3, A-2	0	100	100	70-80	5-15	---	NP
Hooper part-----	0-3	Loamy sand------	SM	A-2, A-4	0	100	95-100	50-75	15-40	---	NP
	3-21	Clay, clay loam	CL, CH	A-7	0	100	100	90-100	70-95	40-60	15-30
	21-37	Sandy clay loam, sandy loam.	SC, SM-SC	A-2, A-4, A-6	0-5	100	100	60-90	30-50	20-40	5-20
	37-60	Sand, gravelly sand.	SM, SP-SM	A-1, A-3, A-2	0-5	75-100	65-100	25-70	5-20	---	NP
Cryaquolls:											
110:											
Cryaquolls part-	0-60	Variable-------	---	---	---	---	---	---	---	---	---
Histosols part--	0-10	Muck-----------	PT	A-8	-	-	-	-	-	---	---
	10-34	Peat-----------	PT	A-8	-	-	-	-	-	---	---
	34-60	Sand-----------	SP-SM	A-1, A-3	0-5	80-100	75-100	30-60	5-10	---	NP
Cumbres:											
11----------	0-4	Very stony loam	CL-ML, CL, SC, SM-SC	A-4, A-6	10-30	75-95	70-85	60-80	45-60	15-35	5-15
	4-16	Very stony clay loam, extremely stony clay loam.	CL	A-6, A-7	35-60	80-90	75-85	75-80	65-75	30-50	15-30
	16-22	Extremely stony sandy loam, very stony sandy loam.	SM	A-2	35-80	75-95	70-80	45-60	25-35	25-35	NP-5
	22	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Derrick:											
12, 13----------	0-5	Very cobbly sandy loam.	GM, ML	A-4	30-60	60-80	55-75	50-70	35-55	20-30	NP-5
	5-17	Very gravelly clay loam, very gravelly loam, very cobbly clay loam.	CL, GC	A-2, A-6	15-60	60-80	45-75	40-70	30-60	25-40	10-20
	17-60	Very gravelly sand, very cobbly sand, gravelly sand.	GP, SP	A-1	10-60	25-70	25-60	10-30	0-5	---	NP
Dunul:											
14----------	0-7	Gravelly sandy loam.	SM	A-1, A-2	5-15	60-70	50-70	30-50	15-30	15-25	NP-5
	7-60	Very gravelly sand, very cobbly loamy sand.	SP, GP	A-1	25-55	40-70	25-50	10-30	0-5	---	NP
115:											
Dunul part------	0-7	Gravelly sandy loam.	SM	A-1, A-2	5-15	60-70	50-70	30-50	15-30	15-25	NP-5
	7-60	Very gravelly sand, very cobbly loamy sand.	SP, GP	A-1	25-55	40-70	25-50	10-30	0-5	---	NP

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Dunul:											
Lamanga part----	0-6	Sandy clay loam	CL-ML	A-4	0-5	95-100	95-100	80-95	60-75	20-30	5-10
	6-19	Clay loam, sandy clay loam.	CL-ML, CL	A-4, A-6	0-5	95-100	90-100	80-100	50-80	25-35	5-15
	19-60	Gravelly sandy loam, gravelly loam.	GM, ML	A-2, A-4	0-5	60-80	50-75	40-65	25-55	---	NP
Empedrado:											
16:											
Empedrado part--	0-4	Loam----------	ML	A-4	0-10	95-100	95-100	80-95	55-75	30-40	5-10
	4-22	Clay loam, sandy clay loam.	CL, SM	A-6, A-7	0-10	95-100	85-95	60-90	45-70	30-50	10-25
	22-60	Sandy loam, loam	SM, ML	A-2, A-4	0-10	95-100	90-100	55-80	25-60	20-30	NP-5
Curecanti part--	0-3	Very cobbly loam	SM-SC, CL-ML	A-4	50-60	75-95	60-85	55-75	45-55	20-30	5-10
	3-34	Very cobbly sandy clay loam.	SM-SC, SM, GM-GC, GM	A-1, A-2, A-4	30-70	40-75	35-70	30-60	15-45	15-25	NP-5
	34-60	Very cobbly sandy loam, very cobbly loamy sand, extremely cobbly loamy sand.	SM, GM, GP-GM, SP-SM	A-1, A-2	35-70	25-60	25-60	15-50	5-30	15-25	NP-5
Garita:											
17, 18----------	0-7	Cobbly loam-----	GM, SM, GM-GC, SM-SC	A-4	15-30	65-75	60-75	55-60	35-50	25-35	5-10
	7-60	Very gravelly loam, very gravelly sandy loam, very cobbly loam.	GM, SM, GM-GC, SM-SC	A-1, A-2	5-65	35-75	20-50	15-45	10-30	15-25	NP-10
Graypoint:											
19, 20----------	0-5	Gravelly sandy loam.	SM	A-1, A-2	0-10	60-80	55-75	35-50	15-30	20-35	NP-10
	5-18	Gravelly sandy clay loam, sandy clay loam.	SC	A-2, A-6	0-10	60-80	55-80	45-75	20-40	30-40	10-20
	18-72	Gravelly sand, very gravelly sand.	SP, GP	A-1	0-15	25-70	20-60	10-35	0-5	---	NP
21----------	0-5	Gravelly sandy loam.	SM	A-2, A-1	0-10	60-80	50-75	35-50	15-30	---	NP
	5-18	Gravelly sandy clay loam, sandy clay loam.	SC	A-2, A-6	0-10	60-85	55-85	45-70	20-40	25-35	10-20
	18-72	Gravelly sand, very gravelly sand.	SP, GP	A-1	0-15	25-70	20-60	10-30	0-5	---	NP
Hooper:											
22----------	0-3	Clay loam-------	CL	A-6	0	100	100	90-100	70-80	30-40	10-20
	3-21	Clay, clay loam	CL, CH	A-7	0	100	100	90-100	70-95	40-60	15-30
	21-37	Sandy clay loam, sandy loam.	SC, SM-SC	A-2, A-4, A-6	0-5	100	100	60-90	30-50	20-40	5-20
	37-60	Sand, gravelly sand.	SM, SP-SM	A-1, A-3, A-2	0-5	75-100	65-100	25-70	5-20	---	NP

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Hooper:											
23	0-6	Loamy sand	SM	A-2, A-4	0	100	95-100	50-75	15-40	---	NP
	6-21	Clay, clay loam	CL, CH	A-7	0	100	100	90-100	70-95	40-60	5-30
	21-37	Sandy clay loam, sandy loam.	SC, SM-SC	A-2, A-4, A-6	0-5	100	100	60-90	30-50	20-40	5-20
	37-60	Sand, gravelly sand.	SM, SP-SM	A-1, A-3, A-2	0-5	75-100	65-100	25-70	5-20	---	NP
Jerry:											
24	0-12	Loam	ML, CL-ML	A-4	0	80-100	75-100	70-95	55-70	20-35	NP-10
	12-34	Gravelly clay loam, clay loam, cobbly clay loam.	GC, CL, CH	A-6, A-7	0-30	50-90	50-80	45-70	35-70	35-60	20-35
	34-60	Gravelly loam, cobbly clay.	GC, CL, CL-ML, GM-GC	A-2, A-4	0-30	50-90	50-75	40-70	30-60	20-45	5-25
LaJara:											
25	0-3	Loam	ML, SM, CL-ML, SM-SC	A-4	0	80-100	75-100	70-90	45-70	25-40	5-10
	3-60	Sandy loam	SM	A-2, A-4	0	80-100	75-100	50-70	30-40	20-30	NP-5
Lamanga:											
26	0-6	Sandy clay loam	CL-ML	A-4	0-5	95-100	95-100	80-95	60-75	20-30	5-10
	6-19	Clay loam, sandy clay loam.	CL-ML, CL	A-4, A-6	0-5	95-100	90-100	80-100	50-80	25-35	5-15
	19-60	Gravelly sandy loam, gravelly loam.	GM, ML	A-2, A-4	0-5	60-80	50-75	40-65	25-55	---	NP
LaSauses:											
27	0-4	Sandy clay loam	CL-ML, CL, SC, SM-SC	A-4, A-6	0	100	100	90-100	45-80	25-35	5-15
	4-52	Clay, clay loam	CL, CH	A-7	0	100	100	95-100	85-95	40-60	20-40
	52-60	Sand and gravel	GP, GW, SP, SW	A-1	0	50-70	30-50	15-30	0-5	---	NP
Luhon:											
28, 29	0-8	Loam	ML	A-4	0-5	80-100	80-100	65-95	50-80	15-25	NP-5
	8-60	Loam, gravelly clay loam, gravelly loam.	ML, GM	A-4	0-10	55-100	50-95	35-90	35-75	25-35	NP-10
McGinty:											
30	0-15	Sandy loam	SM	A-2, A-4	0	95-100	90-100	60-70	30-40	20-30	NP-5
	15-60	Sandy loam	SM	A-2, A-4	0	80-100	75-100	55-70	30-40	20-30	NP-5
31, 32	0-15	Sandy loam	SM	A-2, A-4	0	90-100	80-100	60-70	30-40	20-30	NP-5
	15-60	Sandy loam, gravelly sandy loam.	SM	A-2, A-4	0	90-100	70-100	55-70	30-40	20-30	NP-5
Miracle:											
33	0-7	Loam	SM, ML	A-4	0	80-100	75-100	70-85	35-65	15-25	NP-5
	7-22	Sandy clay loam	SC, CL	A-6	0	80-100	75-100	70-90	40-55	25-35	10-15
	22	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Mishak:											
34	0-16	Loam	CL	A-6	0-10	95-100	90-100	75-95	50-75	30-40	10-20
	16-44	Loam	CL	A-6	0-10	95-100	90-100	75-95	50-65	30-40	10-20
	44-60	Sandy loam	SM-SC	A-4	0-10	95-100	90-100	75-95	35-50	25-30	5-10

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Mishak:											
35	0-16	Loam	CL-ML, CL	A-6, A-4	0-10	95-100	90-100	60-90	50-70	20-40	5-20
	16-44	Loam	CL	A-6	0-10	95-100	90-100	60-90	50-65	20-40	10-20
	44-60	Sandy loam	SM-SC	A-4	0-10	90-100	85-95	55-85	35-50	25-30	5-10
Mogote:											
36	0-8	Loam	CL-ML	A-4	0	95-100	95-100	80-95	60-75	20-30	5-10
	8-37	Loam, clay loam	CL-ML, CL	A-4, A-6	0	95-100	95-100	80-95	65-80	20-35	5-15
	37-45	Loam, sandy loam	SM, ML	A-2, A-4	0	75-100	75-95	50-90	30-75	---	NP
	45-60	Sand and gravel	GP	A-1	0	25-50	20-40	10-20	0-5	---	NP
Monte:											
37, 38	0-9	Loam	ML	A-4	0-10	95-100	90-100	75-95	55-75	30-40	5-10
	9-60	Loam	ML	A-4	0-10	95-100	90-100	75-95	55-75	30-40	5-10
Mosca:											
39	0-3	Loamy sand	SM	A-2	0	90-100	75-100	50-75	15-30	---	NP
	3-36	Sandy loam	SM	A-2	0	90-100	75-100	50-75	25-35	---	NP
	36-60	Gravelly sand, sand, very gravelly sand.	SP, SP-SM	A-1	0-5	60-100	40-80	35-50	0-10	---	NP
40	0-3	Loamy sand	SM	A-2	0	90-100	75-100	50-75	15-30	---	NP
	3-36	Sandy loam	SM	A-2	0	90-100	75-100	50-75	25-35	---	NP
	36-60	Gravelly sand, very gravelly sand, sand.	SP, SP-SM, SM	A-1	0-5	60-100	40-80	35-50	0-10	---	NP
Nortonville:											
41	0-12	Loam	CL-ML, CL	A-4, A-6	0	100	100	90-100	65-80	25-35	5-15
	12-60	Loam, clay loam, fine sandy loam.	CL-ML, ML, SM, SM-SC	A-4	0	90-100	85-100	75-95	35-75	20-35	5-10
Platoro:											
42	0-18	Loam	ML, CL, CL-ML	A-4, A-6	0-5	90-100	75-100	60-80	50-65	20-35	NP-15
	18-24	Very gravelly loam, gravelly sandy loam.	SM, GM	A-1	5-25	40-75	20-60	15-35	10-15	---	NP
	24-60	Very gravelly loamy sand, very gravelly sand.	SP, GP, SP-SM, GP-GM	A-1	5-25	30-70	20-35	10-25	0-10	---	NP
Quamon:											
43:											
Quamon part	0-16	Gravelly sandy loam.	SM, SM-SC, SC	A-2	0-20	60-85	55-75	35-50	15-30	10-30	NP-10
	16-60	Very gravelly loamy sand, very cobbly loamy sand, very cobbly sand.	SP, GP, SP-SM, GP-GM	A-1	5-55	40-70	20-60	10-35	0-15	---	NP
LaJara part	0-3	Loam	ML, SM, CL-ML, SM-SC	A-4	0	80-100	75-100	70-90	45-70	25-40	5-10
	3-60	Sandy loam	SM	A-2, A-4	0	80-100	75-100	50-70	30-40	20-30	NP-5
Ryan Park:											
44	0-5	Sandy loam	SM	A-2	0	85-100	85-100	70-80	15-30	10-20	NP-5
	5-60	Sandy loam	SM	A-2, A-4	0	85-100	85-100	60-70	25-40	10-20	NP-5

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[The symbol < means less than; > means more than. Entries under "Wind erodibility group" apply only to the surface layer. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete	Wind erodibility group
	In	In/hr	In/in	pH	Mmhos/cm				
Acacio:									
1	0-4	2.0-6.0	0.08-0.13	7.4-9.0	2-4	Low	High	High	4L
	4-14	0.6-2.0	0.10-0.13	7.4-8.4	2-8	Moderate	High	High	
	14-60	0.6-2.0	0.08-0.11	7.4-8.4	4-16	Low	High	High	
Alamosa:									
2	0-6	0.6-2.0	0.16-0.20	7.4-8.4	2-16	Low	High	Moderate	6
	6-38	0.2-2.0	0.18-0.20	7.4-8.4	2-16	Moderate	High	Moderate	
	38-60	2.0-6.0	0.08-0.16	7.4-8.4	<16	Low	High	Moderate	
Aquic Ustorthents:									
3	0-60	---	---	---	---	---	---	---	---
Aquolls:									
4:									
Aquolls part	0-60	---	---	---	---	---	---	---	---
Aquents part	0-60	---	---	---	---	---	---	---	---
Arena:									
5	0-2	0.2-0.6	0.14-0.17	>8.4	2-16	Moderate	High	High	4
	2-30	0.2-0.6	0.14-0.17	>9.0	8-16	Moderate	High	High	
	30	---	---	---	---	---	---	---	
6	0-2	0.2-0.6	0.14-0.17	7.9-9.0	2-8	Moderate	High	High	4
	2-30	0.2-0.6	0.08-0.12	>9.0	4-16	Moderate	High	High	
	30	---	---	---	---	---	---	---	
Bushvalley:									
7	0-4	0.6-2.0	0.08-0.11	6.1-7.8	<2	Low	Moderate	Moderate	---
	4-17	0.2-0.6	0.04-0.11	6.1-7.8	<2	Moderate	Moderate	Moderate	
	17	---	---	---	---	---	---	---	
8:									
Bushvalley part	0-4	0.6-2.0	0.08-0.11	6.1-7.8	<2	Low	Moderate	Moderate	---
	4-17	0.2-0.6	0.04-0.11	6.1-7.8	<2	Moderate	Moderate	Moderate	
	17	---	---	---	---	---	---	---	
Youga part	0-7	0.6-2.0	0.10-0.18	6.6-7.3	<2	Low	Moderate	Low	---
	7-31	0.06-0.2	0.12-0.18	6.6-7.3	<2	Moderate	Moderate	Low	
	31-44	0.06-0.6	0.11-0.16	6.6-7.3	<2	Moderate	Moderate	Low	
	44	---	---	---	---	---	---	---	
Corlett:									
9:									
Corlett part	0-8	6.0-20	0.04-0.06	>8.4	<4	Low	High	Moderate	
	8-60	6.0-20	0.04-0.06	>8.4	>4	Low	High	Moderate	
Hooper part	0-3	2.0-6.0	0.06-0.08	>9.0	<4	Low	High	Low	2
	3-21	<0.06	0.04-0.06	>9.0	4-8	High	High	Low	
	21-37	0.6-2.0	0.04-0.06	7.9-9.0	2-4	Moderate	High	Low	
	37-60	6.0-20	0.03-0.05	7.9-9.0	<4	Low	High	Low	
Cryaquolls:									
10:									
Cryaquolls part	0-60	---	---	---	---	---	---	---	---
Histosols part	0-10	2.0-6.0	0.25-0.30	5.6-6.5	<2	Low	High	High	8
	10-34	2.0-6.0	0.25-0.30	6.1-6.5	<2	Low	High	High	
	34-60	>20	0.04-0.06	6.1-6.5	<2	Low	High	High	
Cumbres:									
11	0-4	0.6-2.0	0.14-0.16	6.6-7.3	<2	Low	Moderate	Low	8
	4-16	0.2-0.6	0.09-0.11	6.6-8.4	<2	Moderate	High	Low	
	16-22	2.0-6.0	0.05-0.08	7.9-8.4	<2	Low	High	Low	
	22	---	---	---	---	---	---	---	

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete	Wind erodibility group
	In	In/hr	In/in	pH	Mmhos/cm				
Derrick:									
12, 13	0-5	2.0-6.0	0.10-0.13	6.6-7.8	<2	Low	Moderate	Low	8
	5-17	0.6-2.0	0.11-0.14	6.6-8.4	<2	Low	Moderate	Low	
	17-60	>20	0.04-0.06	7.4-8.4	<2	Low	High	Low	
Dunul:									
14	0-7	6.0-20	0.07-0.09	7.4-8.4	<4	Low	Moderate	Low	6
	7-60	>20	0.04-0.06	7.4-8.4	<4	Low	Moderate	Low	
[1]15:									
Dunul part	0-7	6.0-20	0.07-0.09	7.4-8.4	<4	Low	Moderate	Low	6
	7-60	>20	0.04-0.06	7.4-8.4	<4	Low	Moderate	Low	
Lamanga part	0-6	0.6-2.0	0.14-0.16	6.6-7.8	2-8	Low	High	Low	4L
	6-19	0.2-0.6	0.12-0.15	6.1-7.3	4-8	Moderate	High	Low	
	19-60	2.0-6.0	0.12-0.15	6.6-8.4	<2	Low	High	Low	
Empedrado:									
[1]16:									
Empedrado part	0-4	0.6-2.0	0.16-0.18	7.4-7.8	<2	Low	Moderate	Low	5
	4-22	0.6-2.0	0.19-0.21	7.4-7.8	<2	Moderate	Moderate	Low	
	22-60	2.0-6.0	0.11-0.13	7.9-8.4	<2	Low	High	Low	
Curecanti part	0-3	0.6-2.0	0.06-0.10	6.1-7.3	<2	Low	Moderate	Low	8
	3-34	0.6-2.0	0.06-0.10	6.1-7.3	<2	Low	Moderate	Low	
	34-60	2.0-20	0.05-0.08	6.1-7.3	<2	Low	Moderate	Low	
Garita:									
17, 18	0-7	0.6-2.0	0.05-0.10	7.4-8.4	<2	Low	Moderate	Low	8
	7-60	0.6-2.0	0.05-0.08	7.4-9.0	<2	Low	High	Low	
Graypoint:									
19, 20	0-5	2.0-6.0	0.09-0.11	7.4-8.4	<2	Low	Low	Low	6
	5-18	0.6-2.0	0.14-0.16	7.4-8.4	<2	Moderate	Moderate	Low	
	18-72	>20	0.03-0.05	7.4-8.4	<2	Low	Moderate	Low	
21	0-5	2.0-6.0	0.09-0.11	7.4-8.4	<4	Low	High	Low	3
	5-18	0.6-2.0	0.13-0.15	7.4-8.4	<4	Moderate	High	Low	
	18-72	>20	0.03-0.05	7.4-8.4	<4	Low	High	Low	
Hooper:									
22	0-3	<0.06	0.04-0.06	>9.0	4-8	Moderate	High	Low	4
	3-21	<0.06	0.04-0.06	>9.0	4-8	High	High	Low	
	21-37	0.6-2.0	0.04-0.06	7.9-9.0	2-4	Moderate	High	Low	
	37-60	6.0-20	0.03-0.05	7.9-9.0	<4	Low	High	Low	
23	0-6	2.0-6.0	0.06-0.08	>9.0	<4	Low	High	Low	2
	6-21	<0.06	0.04-0.06	>9.0	4-8	High	High	Low	
	21-37	0.6-2.0	0.04-0.06	7.9-9.0	2-4	Moderate	High	Low	
	37-60	6.0-20	0.03-0.05	7.9-9.0	<4	Low	High	Low	
Jerry:									
24	0-12	0.6-2.0	0.16-0.18	6.6-7.3	<2	Low	Moderate	Low	6
	12-34	0.06-0.2	0.13-0.15	6.6-7.8	<2	High	Moderate	Low	
	34-60	0.6-2.0	0.13-0.15	7.4-8.4	<2	Moderate	Low	Low	
LaJara:									
25	0-3	0.6-2.0	0.13-0.18	7.4-8.4	<2	Low	High	Low	3
	3-60	2.0-6.0	0.11-0.13	7.4-8.4	<2	Low	High	Low	
Lamanga:									
26	0-6	0.6-2.0	0.14-0.16	6.6-7.8	2-8	Low	High	Low	4L
	6-19	0.2-0.6	0.12-0.15	6.1-7.3	4-8	Moderate	High	Low	
	19-60	2.0-6.0	0.12-0.15	6.6-8.4	<2	Low	High	Low	
LaSauses:									
27	0-4	0.06-0.2	0.10-0.12	7.9-9.0	>8	Moderate	High	High	5
	4-52	0.06-0.2	0.07-0.09	5.6-7.8	>8	High	High	High	
	52-60	>20	<0.03	6.6-7.3	<8	Low	High	High	

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Risk of corrosion		Wind erodibility group
							Uncoated steel	Concrete	
	In	In/hr	In/in	pH	Mmhos/cm				
Luhon:									
28, 29	0-8	0.6-2.0	0.16-0.20	7.9-8.4	2-4	Low	High	Moderate	4L
	8-60	0.6-2.0	0.11-0.13	7.9-8.4	4-8	Low	High	Moderate	
McGinty:									
30	0-15	2.0-6.0	0.11-0.13	7.4-8.4	2-8	Low	High	Low	3
	15-60	2.0-20	0.10-0.12	7.9-8.4	2-8	Low	High	Low	
31, 32	0-15	2.0-6.0	0.11-0.13	7.4-8.4	<2	Low	High	Low	3
	15-60	2.0-20	0.10-0.12	7.4-8.4	<2	Low	High	Low	
Miracle:									
33	0-7	2.0-6.0	0.12-0.15	6.6-7.3	<2	Low	Moderate	Low	3
	7-22	0.6-2.0	0.14-0.16	6.6-7.8	<2	Moderate	Moderate	Low	
	22	---	---	---	---	---	---	---	
Mishak:									
34	0-16	0.6-2.0	0.08-0.11	>8.4	>8	Moderate	High	Moderate	5
	16-44	0.6-2.0	0.08-0.11	7.9-9.0	>8	Moderate	High	Moderate	
	44-60	0.6-2.0	0.13-0.15	7.9-9.0	8-16	Low	High	Moderate	
35	0-16	0.6-2.0	0.08-0.11	7.9-9.0	4-16	Moderate	High	Moderate	8
	16-44	0.6-2.0	0.08-0.12	7.9-9.0	4-16	Moderate	High	Moderate	
	44-60	0.6-2.0	0.08-0.10	7.9-9.0	4-8	Low	High	Moderate	
Mogote:									
36	0-8	0.6-2.0	0.14-0.16	7.9-8.4	2-8	Low	High	Moderate	4L
	8-37	0.6-2.0	0.12-0.15	7.9-8.4	4-8	Moderate	High	Moderate	
	37-45	0.6-2.0	0.12-0.15	6.6-8.4	<2	Low	High	Low	
	45-60	>20	0.03-0.05	6.6-7.8	<2	Low	High	Low	
Monte:									
37, 38	0-9	0.6-2.0	0.16-0.18	7.9-8.4	<2	Low	High	Low	5
	9-60	0.6-2.0	0.16-0.18	7.9-8.4	<2	Low	High	Low	
Mosca:									
39	0-3	2.0-20	0.06-0.10	7.9-9.0	<4	Low	High	Low	2
	3-36	0.6-2.0	0.10-0.13	>9.0	<8	Low	High	Low	
	36-60	>20	0.05-0.08	7.9-9.0	<4	Low	High	Low	
40	0-3	2.0-20	0.06-0.10	7.9-9.0	8-16	Low	High	High	1
	3-36	0.6-2.0	0.10-0.13	7.9-9.0	4-16	Low	High	High	
	36-60	>20	0.05-0.08	7.9-9.0	4-8	Low	High	High	
Nortonville:									
41	0-12	0.2-0.6	0.11-0.15	7.9-9.0	>8	Moderate	High	Moderate	5
	12-60	0.2-0.6	0.16-0.18	7.9-9.0	2-8	Low	High	Moderate	
Platoro:									
42	0-18	0.6-2.0	0.16-0.20	7.4-8.4	<2	Low	High	Moderate	4L
	18-24	2.0-6.0	0.07-0.13	7.4-8.4	<2	Low	High	Moderate	
	24-60	6.0-20	0.05-0.08	7.4-8.4	<2	Low	High	Moderate	
Quamon:									
43:									
Quamon part	0-16	2.0-6.0	0.09-0.11	7.9-8.4	<2	Low	High	Low	6
	16-60	>20	0.04-0.06	7.9-8.4	<2	Low	High	Low	
LaJara part	0-3	0.6-2.0	0.13-0.18	7.4-8.4	<2	Low	High	Low	3
	3-60	2.0-6.0	0.11-0.13	7.4-8.4	<2	Low	High	Low	
Ryan Park:									
44	0-5	2.0-6.0	0.08-0.11	6.6-7.8	<2	Low	Moderate	Low	2
	5-60	2.0-6.0	0.11-0.13	6.6-8.4	<2	Low	Moderate	Low	
San Arcacio:									
45	0-8	2.0-6.0	0.11-0.13	7.4-7.9	<8	Low	High	Low	3
	8-23	0.6-2.0	0.14-0.16	7.4-8.4	<2	Moderate	High	Low	
	23-60	>6.0	0.04-0.06	7.4-8.4	<4	Low	High	Low	

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Risk of corrosion		Wind erodibility group
							Uncoated steel	Concrete	
	In	In/hr	In/in	pH	Mmhos/cm				
San Arcacio:									
46	0-8	2.0-6.0	0.11-0.13	7.9-9.0	8-16	Low	High	Moderate	3
	8-23	0.6-2.0	0.14-0.16	7.9-9.0	4-16	Moderate	High	Moderate	
	23-60	>6.0	0.04-0.06	7.4-8.4	<4	Low	High	Low	
Seitz:									
47	0-12	0.6-2.0	0.08-0.10	6.6-7.3	<2	Low	Moderate	Low	8
	12-30	0.06-0.2	0.10-0.12	6.1-6.6	<2	Moderate	Moderate	Low	
	30-60	0.2-0.6	0.12-0.14	6.1-6.6	<2	Moderate	Moderate	Low	
Shawa:									
48, 49	0-24	0.6-2.0	0.16-0.18	6.6-7.8	<2	Low	Moderate	Low	5
	24-60	0.6-2.0	0.14-0.16	7.4-7.8	<2	Low	Moderate	Low	
50	0-60	0.6-2.0	0.16-0.18	7.4-7.8	2-8	Low	Moderate	Low	8
Space City:									
51	0-4	6.0-20	0.07-0.10	7.4-8.4	<2	Low	Moderate	Low	2
	4-60	>6.0	0.04-0.08	7.4-8.4	<2	Low	High	Low	
Stunner:									
52	0-5	0.6-2.0	0.16-0.18	6.6-7.3	<2	Low	Moderate	Low	5
	5-13	0.6-2.0	0.17-0.20	6.6-7.8	<4	Moderate	High	Low	
	13-60	0.6-2.0	0.14-0.16	7.9-8.4	<2	Low	High	Low	
Travelers:									
53, 54	0-16	0.6-2.0	0.06-0.09	7.9-8.4	<2	Low	High	Low	8
	16	---	---	---	---	---	---	---	
Vastine:									
55	0-3	0.6-2.0	0.16-0.21	7.4-8.4	<4	Low	High	Moderate	5
	3-37	0.6-2.0	0.16-0.21	7.4-8.4	<4	Moderate	High	Moderate	
	37-60	6.0-20	0.04-0.08	7.4-8.4	<4	Low	High	Moderate	
Zinzer:									
56	0-17	0.6-2.0	0.14-0.16	7.9-8.4	2-16	Low	High	Low	5
	17-60	0.6-2.0	0.12-0.14	7.9-9.0	<8	Low	High	Low	
57	0-17	0.6-2.0	0.14-0.18	8.5-9.0	4-16	Moderate	High	High	5
	17-60	0.6-2.0	0.12-0.16	7.9-9.0	2-8	Moderate	High	High	

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole unit.

TABLE 16.--SOIL AND WATER FEATURES

[The definitions of "flooding" and "water table" in the Glossary explain terms such as "brief" and "frequent." The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydrologic group	Flooding			High water table		Bedrock		Cemented pan		Potential frost action
		Frequency	Duration	Months	Depth	Months	Depth	Hardness	Depth	Hardness	
					Ft		In		In		
Acacio:											
1	B	None	---	---	>6.0	---	>60	---	---	---	Low.
Alamosa:											
2	C	Frequent	Brief	May-Jun	1.0-1.5	Apr-Jul	>60	---	---	---	High.
Aquic Ustorthents:											
3	C	Occasional	Brief	May-Jul	1.0-2.0	Apr-Jul	>60	---	---	---	Low.
Aquolls:											
4:											
Aquolls part	C	Frequent	Brief	Apr-Jul	0.5-2.5	Jan-Dec	>60	---	---	---	High.
Aquents part	C	Frequent	Brief	Apr-Jul	0.5-2.5	Jan-Dec	>60	---	---	---	High.
Arena:											
5	D	Occasional	Brief	Mar-Jun	1.0-2.0	Apr-Aug	>60	---	20-40	Rippable	High.
6	C	None	---	---	3.5-5.0	Apr-Jul	>60	---	20-40	Rippable	High.
Bushvalley:											
7	D	None	---	---	>6.0	---	7-20	Hard	---	---	Moderate.
8:											
Bushvalley part	D	None	---	---	>6.0	---	7-20	Hard	---	---	Moderate.
Youga part	B	None	---	---	>6.0	---	40-60	Hard	---	---	Moderate.
Corlett:											
9:											
Corlett part	A	None	---	---	3.5-6.0	Apr-Aug	>60	---	---	---	Low.
Hooper part	D	None	---	---	4.0-6.0	Apr-Sep	>60	---	---	---	Low.
Cryaquolls:											
10:											
Cryaquolls part	C	Common	Brief	Apr-Jul	0-1.5	Jan-Dec	>60	---	---	---	High.
Histosols part	D	Common	Brief	Apr-Jul	0-1.5	Jan-Dec	>60	---	---	---	High.
Cumbres:											
11	C	None	---	---	>6.0	---	20-40	Hard	---	---	Low.
Derrick:											
12, 13	B	None	---	---	>6.0	---	>60	---	---	---	Low.
Dunul:											
14	A	None	---	---	>6.0	---	>60	---	---	---	Low.
15:											
Dunul part	A	None	---	---	>6.0	---	>60	---	---	---	Low.
Lamanga part	C	None	---	---	1.5-3.0	Apr-Aug	>60	---	---	---	High.
Empedrado:											
16:											
Empedrado part	B	None	---	---	>6.0	---	>60	---	---	---	Moderate.
Curecanti part	B	None	---	---	>6.0	---	>60	---	---	---	Moderate.
Garita:											
17, 18	B	None	---	---	>6.0	---	>60	---	---	---	Low.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table		Bedrock		Cemented pan		Potential frost action
		Frequency	Duration	Months	Depth	Months	Depth	Hardness	Depth	Hardness	
					Ft		In		In		
Graypoint:											
19, 20	B	None	---	---	>6.0	---	>60	---	---	---	Moderate.
21	C	None	---	---	1.5-2.0	Apr-Sep	>60	---	---	---	Moderate.
Hooper:											
22, 23	D	None	---	---	4.0-6.0	Apr-Sep	>60	---	---	---	Low.
Jerry:											
24	C	None	---	---	>6.0	---	>60	---	---	---	Moderate.
LaJara:											
25	D	Frequent	Brief	Apr-Jul	0-1.0	Apr-Jul	>60	---	---	---	High.
Lamanga:											
26	C	None	---	---	1.5-3.0	Apr-Sep	>60	---	---	---	High.
LaSauses:											
27	D	Rare	---	---	0.5-2.0	Apr-Jul	>60	---	---	---	Moderate.
Luhon:											
28, 29	B	None	---	---	>6.0	---	>60	---	---	---	Low.
McGinty:											
30	B	None	---	---	4.5-5.0	Apr-Jul	>60	---	---	---	Moderate.
31, 32	B	None	---	---	>6.0	---	>60	---	---	---	Low.
Miracle:											
33	B	None	---	---	>6.0	---	20-40	Hard	---	---	Moderate.
Mishak:											
34	C	None	---	---	1.0-2.0	Apr-Aug	>60	---	---	---	High.
35	C	None	---	---	3.0-4.5	Apr-Aug	>60	---	---	---	High.
Mogote:											
36	C	Rare	---	---	2.0-3.5	Apr-Sep	>60	---	---	---	High.
Monte:											
37, 38	B	None	---	---	>6.0	---	>60	---	---	---	Low.
Mosca:											
39	B	None	---	---	>6.0	---	>60	---	---	---	Low.
40	B	None	---	---	2.0-3.0	Apr-Aug	>60	---	---	---	High.
Nortonville:											
41	C	Occasional	Brief	Apr-Jul	1.0-2.5	Apr-Jul	>60	---	---	---	High.
Platoro:											
42	B	None	---	---	>6.0	---	>60	---	---	---	Low.
Quamon:											
143:											
Quamon part	A	None	---	---	3.0-5.0	Apr-Sep	>60	---	---	---	Moderate.
LaJara part	D	Frequent	Brief	Apr-Jul	0-1.0	Apr-Jul	>60	---	---	---	High.
Ryan Park:											
44	B	None	---	---	>6.0	---	>60	---	---	---	Low.
San Arcacio:											
45	B	None	---	---	3.0-4.0	Apr-Jul	>60	---	---	---	Moderate.
46	B	None	---	---	1.5-3.0	Apr-Aug	>60	---	---	---	High.
Seitz:											
47	B	None	---	---	>6.0	---	>60	---	---	---	Low.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table		Bedrock		Cemented pan		Potential frost action
		Frequency	Duration	Months	Depth	Months	Depth	Hardness	Depth	Hardness	
					Ft		In		In		
Shawa:											
48, 49	B	None	---	---	>6.0	---	>60	---	---	---	Moderate.
50	B	Occasional	Brief	Apr-Jul	2.0-4.0	Apr-Aug	>60	---	---	---	High.
Space City:											
51	A	None	---	---	>6.0	---	>60	---	---	---	Low.
Stunner:											
52	B	None	---	---	>6.0	---	>60	---	---	---	Low.
Travelers:											
53, 54	D	None	---	---	>6.0	---	10-20	Hard	---	---	Low.
Vastine:											
55	C	Common	Long	Apr-Jul	1.0-2.5	Feb-Aug	>60	---	---	---	High.
Zinzer:											
56	B	None	---	---	>6.0	---	>60	---	---	---	Low.
57	C	None	---	---	2.0-4.0	Apr-Aug	>60	---	---	---	High.

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole unit.

TABLE 17.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Acacio	Fine-loamy, mixed, frigid Typic Haplargids
Alamosa	Fine-loamy, mixed, frigid Typic Argiaquolls
Aquents	Aquents
Aquic Ustorthents	Aquic Ustorthents
Aquolls	Aquolls
Arena	Fine-loamy, mixed, frigid Aquentic Durorthids
Bushvalley	Loamy-skeletal, mixed Argic Lithic Cryoborolls
Corlett	Mixed, frigid Typic Torripsamments
Cryaquolls	Cryaquolls
Cumbres	Clayey-skeletal, mixed Aridic Argiborolls
Curecanti	Loamy-skeletal, mixed Aridic Argiborolls
Derrick	Loamy-skeletal, mixed, frigid Typic Haplargids
Dunul	Sandy-skeletal, mixed, frigid Typic Torriorthents
Empedrado	Fine-loamy, mixed Typic Argiborolls
Garita	Loamy-skeletal, mixed, frigid Typic Calciorthids
Graypoint	Fine-loamy over sandy or sandy-skeletal, mixed, frigid Typic Haplargids
Histosols	Histosols
Hooper	Clayey over sandy or sandy-skeletal, montmorillonitic, frigid Typic Natrargids
Jerry	Fine, montmorillonitic Argic Cryoborolls
LaJara	Coarse-loamy, mixed (calcareous), frigid Typic Haplaquolls
Lamanga	Fine-loamy, mixed, frigid Aquic Haplargids
LaSauses	Fine, mixed, nonacid, frigid Aeric Halaquepts
Luhon	Fine-loamy, mixed Borollic Calciorthids
McGinty	Coarse-loamy, mixed, frigid Typic Calciorthids
Miracle	Fine-loamy, mixed Argic Cryoborolls
Mishak	Fine-loamy, mixed (calcareous), frigid Typic Halaquepts
Mogote	Fine-loamy, mixed (calcareous), frigid Aquic Ustorthents
Monte	Fine-loamy, mixed (calcareous), frigid Typic Torriorthents
Mosca	Coarse-loamy, mixed, frigid Typic Natrargids
Nortonville	Fine-loamy, frigid Typic Calciaquolls
Platoro	Fine-loamy over sandy or sandy-skeletal, mixed Borollic Haplargids
Quamon	Sandy-skeletal, mixed, frigid Typic Ustorthents
Ryan Park	Coarse-loamy, mixed Borollic Haplargids
San Arcacio	Fine-loamy over sandy or sandy-skeletal, mixed, frigid Typic Haplargids
Seitz	Clayey-skeletal, montmorillonitic Typic Cryoboralfs
Shawa	Fine-loamy, mixed Pachic Haploborolls
Space City	Mixed, frigid Typic Torripsamments
Stunner	Fine-loamy, mixed Borollic Haplargids
Travelers	Loamy-skeletal, mixed Borollic Lithic Camborthids
Vastine	Fine-loamy over sandy or sandy-skeletal, mixed, frigid Typic Haplaquolls
Youga	Fine-loamy, mixed Argic Cryoborolls
Zinzer	Fine-loamy, mixed Aridic Calciborolls

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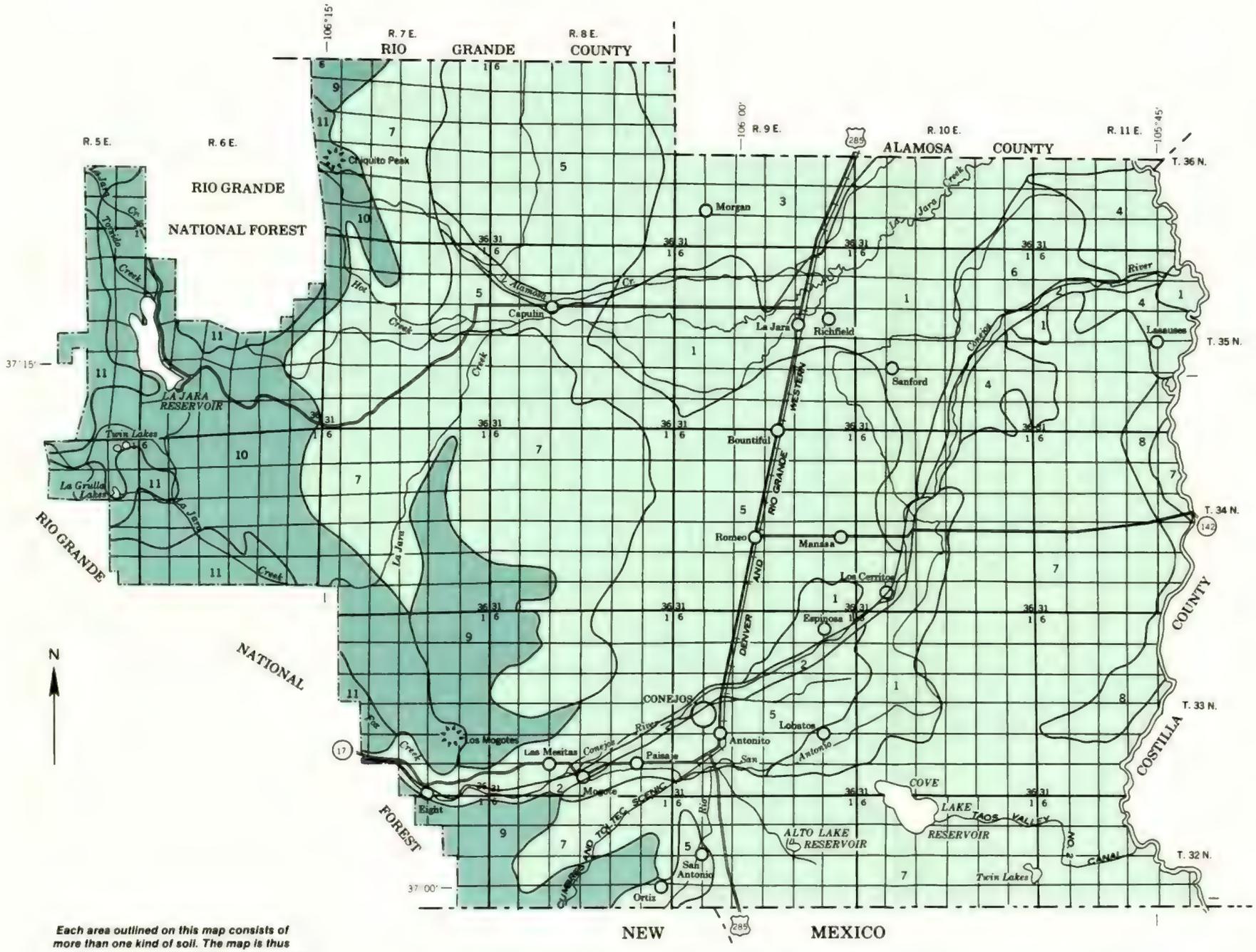


Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

MAP UNITS

SOILS DOMINANTLY ON FLOOD PLAINS, FANS, AND TERRACES

1 — LaJara-Mogote-LaSauses: Nearly level, deep, poorly drained and somewhat poorly drained soils on flood plains and low terraces

2 — Quamon-LaJara-Shawa: Nearly level, deep, moderately well drained and poorly drained soils on flood plains, terraces, and alluvial fans

3 — San Arcacio-Zinzer: Nearly level to gently sloping, deep, well drained and moderately well drained soils on alluvial fans, terraces, and flood plains

4 — Hooper: Nearly level, deep, well drained, saline-alkali affected soils on flood plains

5 — Graypoint: Nearly level and very gently sloping, deep, well drained soils on alluvial fans and terraces

6 — McGinty-Derrick: Nearly level to moderately sloping, deep, well drained soils on alluvial fans and terraces

7 — Travelers-Garita: Nearly level to moderately steep, shallow and deep, somewhat excessively drained and well drained soils on alluvial fans, terraces, ridges, mesas, and hills

8 — Ryan Park: Gently sloping, deep, well drained soils on alluvial fans

SOILS ON HILLS, MOUNTAINS, MESAS, AND INTERMINGLED FANS AND TERRACES

9 — Cumbres-Empedrado-Curecanti: Gently sloping to steep, moderately deep to deep, well drained soils on hills, mountains, alluvial fans, and terraces

10 — Bushvally-Miracle-Youga: Moderately sloping to steep, shallow to deep, well drained soils on mountains, ridges, and mesas

11 — Seitz: Strongly sloping to very steep, deep, well drained soils on mountains and ridges

Compiled 1979

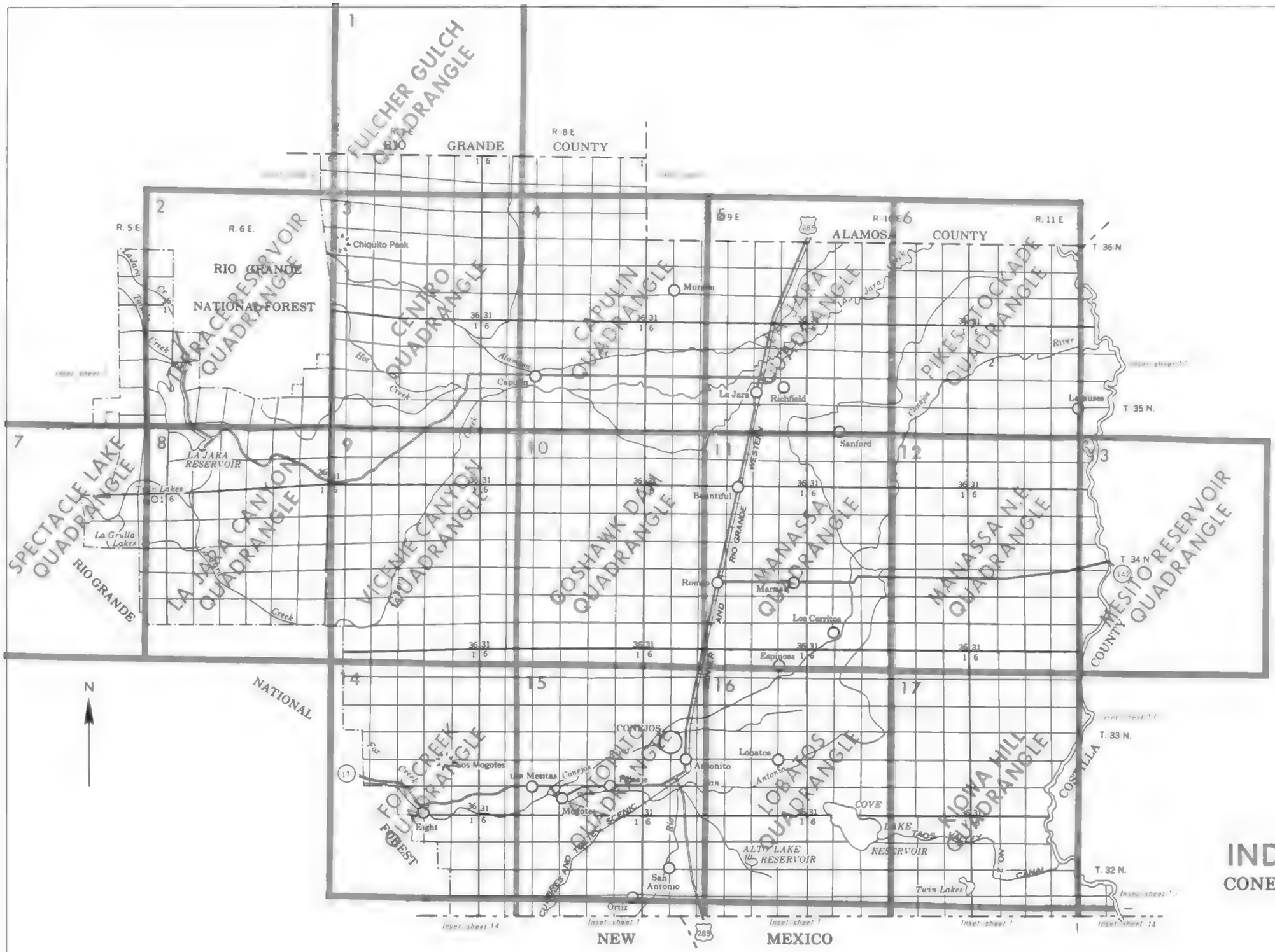
U.S. DEPARTMENT OF AGRICULTURAL
SOIL CONSERVATION SERVICE
UNIVERSITY OF COLORADO AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

CONEJOS COUNTY AREA, COLORADO

Scale 1: 253,440

1 0 1 2 3 4 5 Miles



INDEX TO MAP SHEETS

CONEJOS COUNTY AREA, COLORADO

Scale 1: 253,440

1 0 1 2 3 4 5 Miles

SOIL LEGEND

SYMBOL	NAME
1	Acacio sandy loam
2	Alamosa loam
3	Aquic Ustorthents, gravelly*
4	Aquolls and Aquents, frequently flooded*
5	Arena loam
6	Arena loam, drained
7	Bushvalley very stony loam, 10 to 40 percent slopes
8	Bushvalley-Youga complex, 3 to 25 percent slopes
9	Corlett-Hooper complex, undulating
10	Cryaquolls and Histosols, flooded*
11	Cumbres very stony loam, 1 to 9 percent slopes
12	Derrick very cobbly sandy loam, 0 to 1 percent slopes
13	Derrick very cobbly sandy loam, 1 to 3 percent slopes
14	Dunul gravelly sandy loam
15	Dunul Lamanga complex
16	Empedrado-Curecanti complex, 5 to 25 percent slopes
17	Garita cobbly loam, 0 to 3 percent slopes
18	Garita cobbly loam, 3 to 25 percent slopes
19	Graypoint gravelly sandy loam, 0 to 1 percent slopes
20	Graypoint gravelly sandy loam, 1 to 3 percent slopes
21	Graypoint gravelly sandy loam, wet
22	Hooper clay loam
23	Hooper loamy sand
24	Jerry loam, 3 to 25 percent slopes
25	LaJara loam
26	Lamanga sandy clay loam
27	LaSauses sandy clay loam
28	Luhon loam, 1 to 3 percent slopes
29	Luhon loam, 3 to 9 percent slopes
30	McGinty sandy loam
31	McGinty sandy loam, fan, 1 to 3 percent slopes
32	McGinty sandy loam, fan, 3 to 9 percent slopes
33	Miracle loam, 3 to 9 percent slopes
34	Mishak loam
35	Mishak loam, drained
36	Mogote loam
37	Monte loam, 0 to 1 percent slopes
38	Monte loam, 1 to 3 percent slopes
39	Mosca loamy sand
40	Mosca loamy sand, saline
41	Nortonville loam
42	Platoro loam
43	Quamon-LaJara complex
44	Ryan Park sandy loam, 3 to 5 percent slopes
45	San Arcacio sandy loam
46	San Arcacio sandy loam, saline
47	Seitz very stony loam, 10 to 65 percent slopes
48	Shawa loam, 0 to 1 percent slopes
49	Shawa loam, 1 to 3 percent slopes
50	Shawa loam, wet
51	Space City loamy fine sand, 1 to 9 percent slopes
52	Stunner loam
53	Travelers very stony loam, 1 to 3 percent slopes
54	Travelers very stony loam, 3 to 25 percent slopes
55	Vastine loam
56	Zinzer loam
57	Zinzer loam, saline

*Broadly defined

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline & neatline

AD HOC BOUNDARY (label)

- Small airport, airfield, park, oilfield, cemetery, or flood pool (Davis Airstrip; FLOOD POOL LINE)

STATE COORDINATE TICK

LAND DIVISION CORNERS (sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEMS & DESIGNATIONS

- Interstate (79)
- Federal (410)
- State (52)
- County, farm or ranch (318)

RAILROAD

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or small (water; W)

PITS

- Gravel pit (G.P.)
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School
- Indian mound (label) (Indian Mound)
- Located object (label) (Tower)
- Tank (label) (GAS)
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double line (label) (CANAL)
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial (water; W)
- Intermittent (int; I)

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS (SvE 107)

ESCARPMENTS

- Bedrock (points down slope)
- Other than bedrock (points down slope)

SHORT STEEP SLOPE

GULLY

DEPRESSION OR SINK

SOIL SAMPLE SITE (normally not shown) (S)

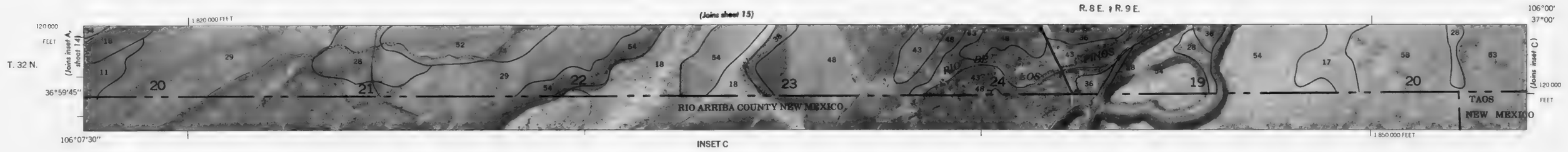
MISCELLANEOUS

- Blowout
- Clay spot
- Gravelly spot
- Gumbo, slick or scabby spot (sodic)
- Dumps and other similar non soil areas
- Prominent hill or peak
- Rock outcrop (includes sandstone and shale)
- Saline spot
- Sandy spot
- Severely eroded spot
- Slide or slip (tips point upslope)
- Stony spot, very stony spot

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 1
CONEJOS COUNTY AREA, COLORADO
(FULCHER GULCH QUADRANGLE)

INSET B

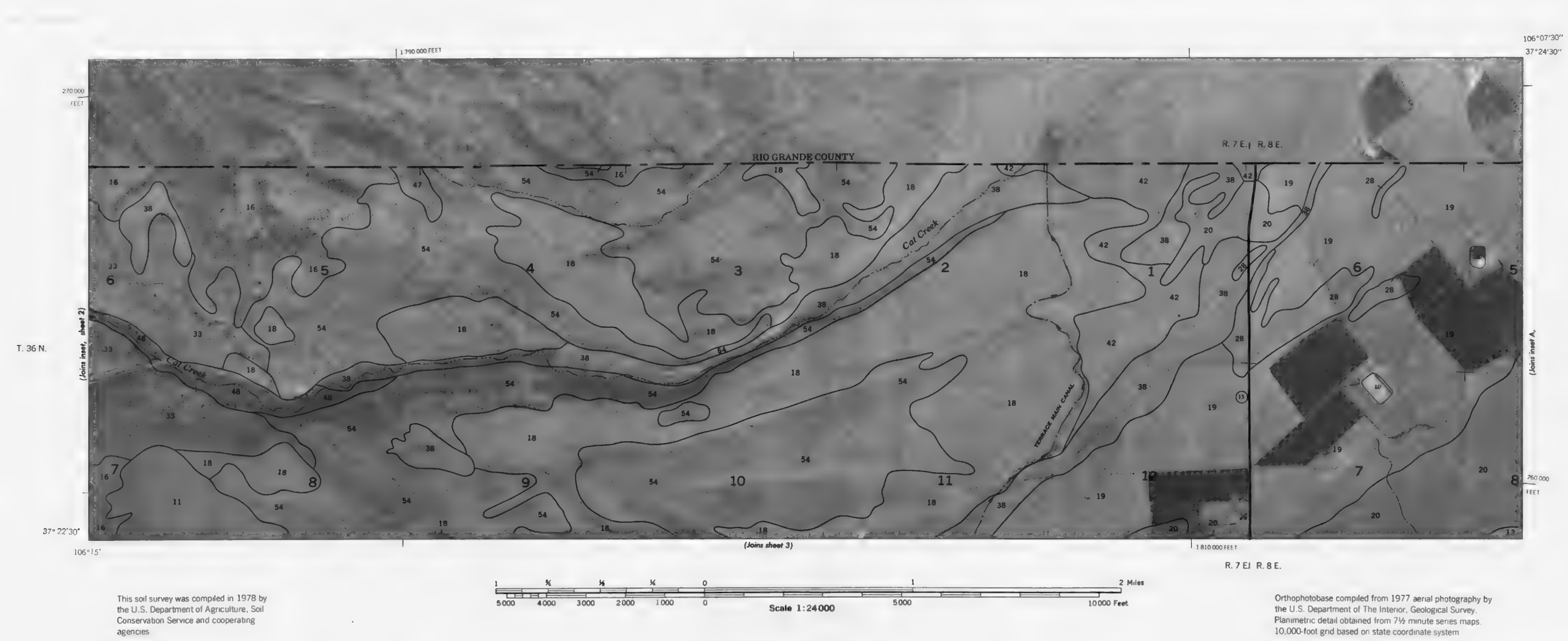


INSET C

INSET D

1000-AND 10000-FOOT GRID TICKS

INSET A



1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

This soil survey was compiled in 1978 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

Orthophotobase compiled from 1977 aerial photography by the U.S. Department of The Interior, Geological Survey. Planimetric detail obtained from 7½ minute series maps. 10,000-foot grid based on state coordinate system

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 2
CONEJOS COUNTY AREA, COLORADO
(TERRACE RESERVOIR QUADRANGLE)
R. 6 E. R. 7 E.

(Joins inset, sheet 2)

INSET

108°15'
37°25'
1 778 000 FEET
270 000 FEET
RIO GRANDE COUNTY
(Joins sheet 1)
T. 36 N.
260 000 FEET
37°22'30"
108° 16'
(Joins upper right sheet 2)
1 782 000 FEET
R. 7 E.
4000 AND 1000-FOOT GRID TICKS

R. 5 E.
R. 6 E.
T. 36 N.
T. 35 N.
La Jara Creek
Porsido Creek
La Jara Reservoir
Jim Creek
Freed Gulch
Posito Creek
Hot Creek
Paso Creek
SOIL
SURVEY
LIMIT
(Joins sheet 7)
(Joins sheet 3)
(Joins sheet 8)

Scale 1:24000
1 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet

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SOIL CONSERVATION SERVICE

SHEET NO. 3
CONEJOS COUNTY AREA, COLORADO
(CENTRO QUADRANGLE)

R. 7 E.
R. 8 E.

1 790 000 FEET

(Joins sheet 1)

106° 07' 30"

37° 22' 30"

T. 36 N.
T. 35 N.

(Joins sheet 2)

LIMIT OF SOIL SURVEY

(Joins sheet 4)

T. 36 N.
T. 35 N.

ALAMOSA RIVER

TERRACE MAIN CANAL

ALAMOSA CREEK CANAL

VALLEY DITCH NO. 9

VIEJO DITCH

Ojito Creek

Hot Creek

Paso Creek

RA JADERO CANYON

TRUJILLO CANYON

37° 15'

106° 15'

(Joins sheet 9)

1 810 000 FEET

R. 7 E.

R. 8 E.

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1 ⅝ ½ ⅛ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

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Planimetric detail obtained from 7½ minute series maps
10,000-foot grid based on state coordinate system

CONEJOS COUNTY AREA, COLORADO NO 3

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 4
CONEJOS COUNTY AREA, COLORADO
(CAPULIN QUADRANGLE)

R. 8 E. R. 9 E.

1 820 000 FEET

106° 00'

37° 22'30"

(Joins inset A, sheet 1)

250 000 FEET

T. 36 N.

T. 35 N.

(Joins sheet 3)

(Joins sheet 5)

37° 15'

106° 07'30"

(Joins sheet 10)

R. 8 E. R. 9 E.

185 000 FEET

220 000 FEET

ALAMOSA COUNTY

MONTE VISTA CANAL

ALAMOSA CREEK CANAL

MORGANVILLE DITCH

MORGAN DRAIN

FLINTHOM DITCH

VIEJO DITCH

SPRING CREEK DITCH

NORTH ALAMOSA DITCH

ALAMOSA RIVER

La Jara Creek

Los Arroyos

Sanford

Capulin

1 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

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10,000-foot grid based on state coordinate system

U. S. DEPARTMENT OF AGRICULTURE
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SHEET NO.5
CONEJOS COUNTY AREA, COLORADO
(LA JARA QUADRANGLE)

1 860 000 FEET

105° 52'30"

37° 22'30"

250 000 FEET

ALAMOSA COUNTY

R. 9 E. | R. 10 E.

T. 36 N.
T. 35 N.

(Joins sheet 4)

(Joins sheet 6)

220 000 FEET

37°15'

106°00'

(Joins sheet 11)

R. 9 E. | R. 10 E.

1 890 000 FEET

1 ⅝ ⅓ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

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10,000-foot grid based on state coordinate system

R. 10 E. R. 11 E.

1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

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CONEJOS COUNTY AREA, COLORADO NO. 6

U. S. DEPARTMENT OF AGRICULTURE
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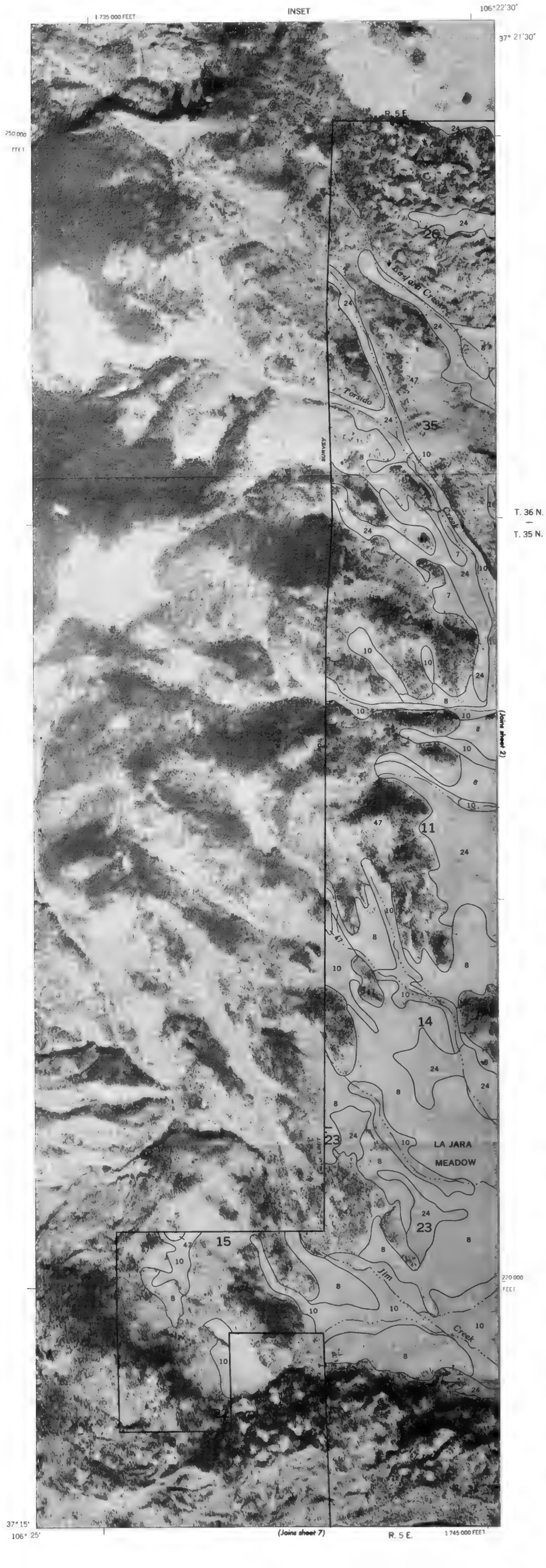
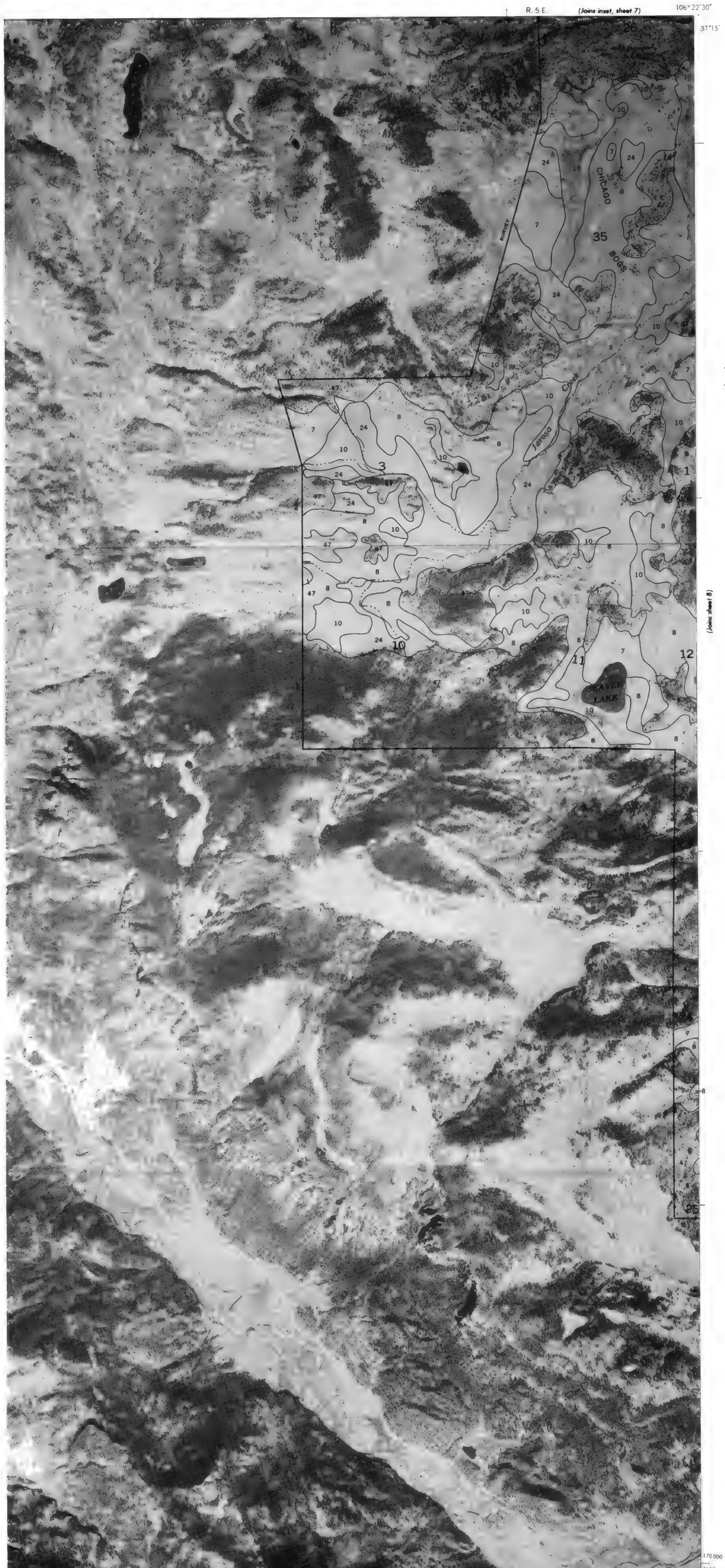
SHEET NO. 7
CONEJOS COUNTY AREA, COLORADO
(SPECTACLE LAKE QUADRANGLE)

INSET





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SHEET NO. 8
CONEJOS COUNTY AREA, COLORADO
(LA JARA CANYON QUADRANGLE)

R. 5 E. | R. 6 E.

(Joins sheet 2)

R. 6 E. R. 7 E.

106°15'

37°15'

T. 35 N.

T. 34 N.

LA JARA RESERVOIR

Fredd Gulch

DRY CANYON

CHICAGO BOGS

Jarosa Creek

TWIN LAKES

BLUEBIRD RESERVOIR

JADERO CANYON

LEANDRO CANYON

ROMERO CANYON

LA JARA CANYON

BIG MEADOW

Fox Creek

La Jara Creek

int

(Joins sheet 7)

(Joins sheet 9)

R. 5 E. | R. 6 E.

R. 6 E. | R. 7 E.

1 5000 FEET

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1 ⅝ ½ ⅛ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

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10,000-foot grid based on state coordinate system

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SHEET NO. 9
CONEJOS COUNTY AREA, COLORADO
(VICENTE CANYON QUADRANGLE

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1 ¾ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

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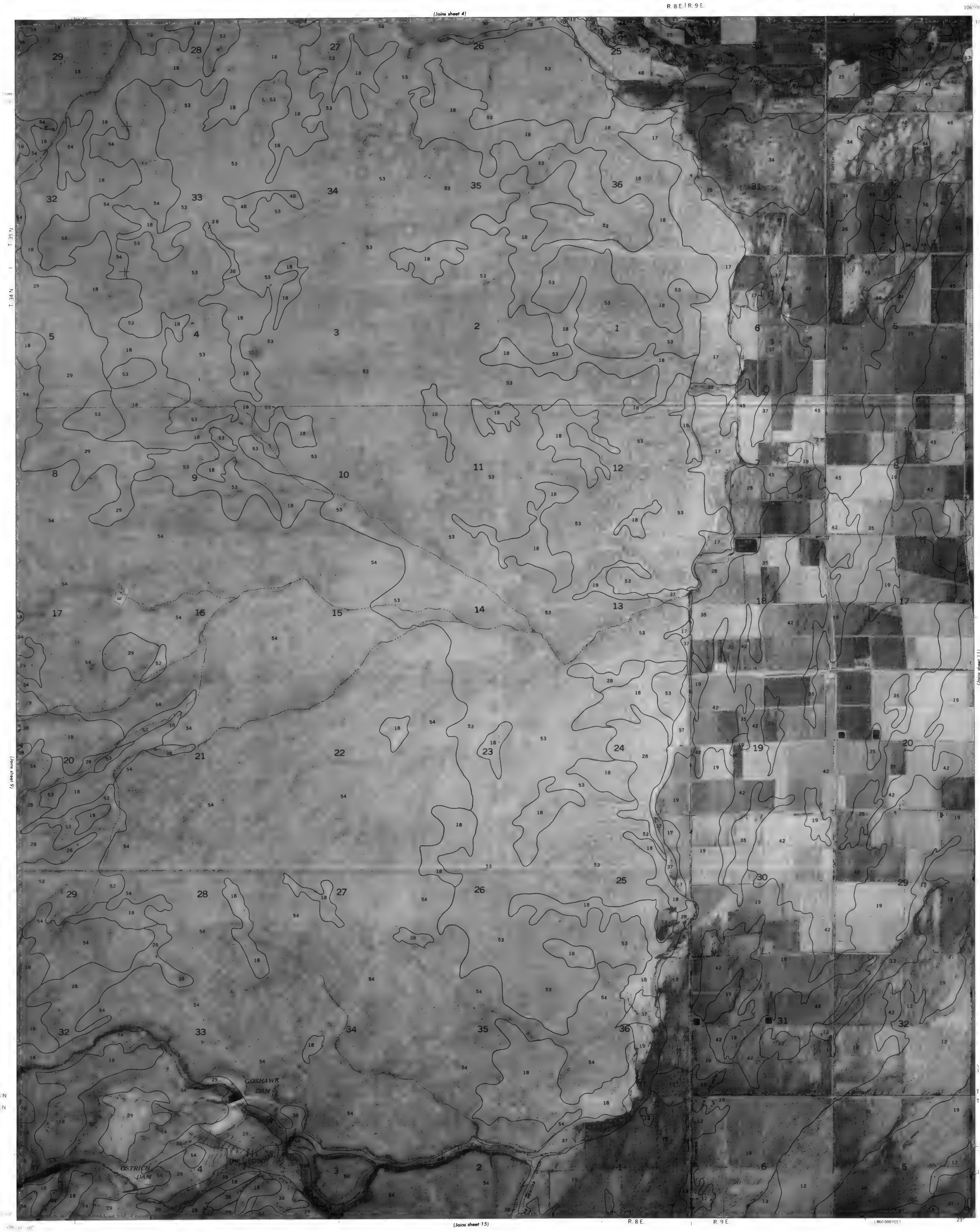
Planimetric detail obtained from 7½ minute series maps
10,000-foot grid based on state coordinate system



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1 ⅜ ½ ⅛ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

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Planimetric detail obtained from 7½ minute series maps
10 000-foot grid based on state coordinate system

CONEJOS COUNTY AREA, COLORADO NO. 10

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 11
CONEJOS COUNTY AREA, COLORADO
(MANASSA QUADRANGLE)

R. 9 E. | R. 10 E.

(Joins sheet 5)

1 860 000 FEET

105°52'30"

37°15'

T. 35 N.
T. 34 N.

Sanford

Manassa

Romeo

Espinosa

DENVER AND RIO GRANDE WESTERN

RICHFIELD CANAL

EPHRIAM DITCH

BOUNTIFUL LATERAL

STAR LATERAL

LONE LATERAL

MANASSA DITCH

SANFORD EPHRIAM DITCH

RICHFIELD DITCH

CANAL

CONEJOS RIVER

RIO SAN ANTONIO

HILLS

North Branch

SAN LUIS HILLS

STOVER DITCH

MARTINEZ DITCH

RINCON EIGHTMILE DITCH

(Joins sheet 10)

(Joins sheet 12)

T. 34 N.
T. 33 N.

37°07'30"

106°00'

(Joins sheet 16)

1 890 000 FEET

R. 9 E. | R. 10 E.

1 ½ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

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U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 12
CONEJOS COUNTY AREA, COLORADO
(MANASSA NE QUADRANGLE)

R. 10 E. | (Joins sheet 6) R. 11 E.

1 900 000 FEET

105°45'

37°15'

210 000 FEET

T. 35 N. — T. 34 N.

LASAUSES DITCH

FLAT TOP

GREASE WOOD FLAT

SAN ANTONIO DITCH

HOMERO DITCH

JOHN JAMES CANYON

(Joins sheet 11)

(Joins sheet 13)

T. 34 N. — T. 33 N.

37° 07'30"

105°52'30"

R. 10 E. (Joins sheet 17) R. 11 E.

1 920 000 FEET

1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10 000 Feet

Scale 1:24 000

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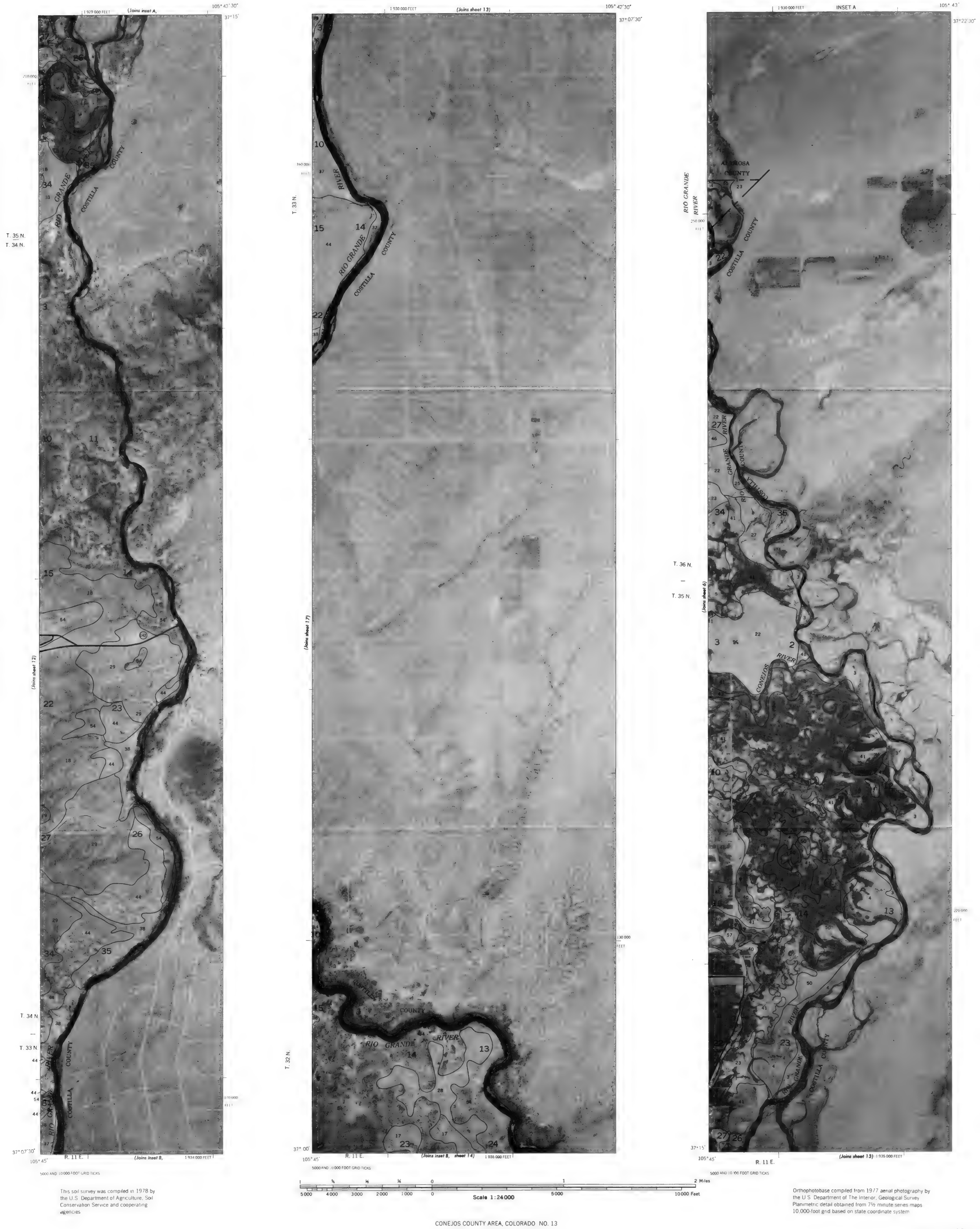
CONEJOS COUNTY AREA, COLORADO NO. 12

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 13
CONEJOS COUNTY AREA, COLORADO
(MESITO QUADRANGLE)

INSET B

INSET A



This soil survey was compiled in 1978 by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies

Scale 1:24000

Orthophotobase compiled from 1977 aerial photography by the U S Department of The Interior, Geological Survey
Planimetric detail obtained from 7½ minute series maps
10,000-foot grid based on state coordinate system

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SOIL CONSERVATION SERVICE

SHEET NO. 14
CONEJOS COUNTY AREA, COLORADO
(FOX CREEK QUADRANGLE)

R. 7 E. | R. 8 E.

1 790 000 FEET (Joins sheet 9) 106°07'30"

37°07'30"

160 000 FEET

Fox Creek

Fox Creek

CONEJOS RIVER

Fox Creek

Bighorn Creek

CANAL DITCH

CONEJOS RIVER

(Joins sheet 15)

T. 33 N.

T. 32 N.

T. 33 N.

T. 32 N.

INSET A

R. 7 E. | R. 8 E.

1 810 000 FEET (Joins sheet 14) 106°07'30"

121 000 FEET

37°00'

36°59'45"

Limit of soil survey

(Joins inset B, sheet 1)

T. 32 N.

RIO ARRIBA COUNTY NEW MEXICO

106°10'

1 815 000 FEET

120 000 FEET

2000 AND 5000-FOOT GRID TICKS

INSET B

R. 11 E.

1 930 000 FEET (Joins inset B, sheet 13) 105°42'30"

37°00'

(Joins sheet 1)

T. 32 N.

TAOS COUNTY NEW MEXICO

CONEJOS COUNTY

36°59'30"

105°45'

1 995 000 FEET

119 000 FEET

2000 AND 5000-FOOT GRID TICKS

37° 00'

106°15'

(Joins inset A)

1 810 000 FEET

R. 7 E.

R. 8 E.

130 000 FEET

1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10000 Feet

Scale 1:24000

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SHEET NO. 15
CONEJOS COUNTY AREA, COLORADO
(ANTONIO QUADRANGLE)

R. 8 E. | R. 9 E.

R. 8 E. | R. 9 E.

1 ⅔ ⅓ ⅓ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

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CONEJOS COUNTY AREA, COLORADO NO. 15

U. S. DEPARTMENT OF AGRICULTURE
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SHEET NO. 16
CONEJOS COUNTY AREA, COLORADO
(LOBATOS QUADRANGLE)

106°00'
37°07'30"
1 860 000 FEET
(Joins sheet 11)
R. 9 E. | R. 10 E.
105°52'30"
37°07'30"
160 000 FEET
(Joins sheet 15)
T. 33 N.
T. 32 N.
(Joins sheet 17)
130 000 FEET
37°00'
106°00'
(Joins inset C, sheet 1)
R. 9 E. | R. 10 E.
1 890 000 FEET
105°52'30"
37°00'

CONEJOS
North Branch
South Branch
RIO SAN ANTONIO
RIO SAN ANTONIO DITCH
ENDTHRILE DITCH
MARTINEZ DITCH
CANON DITCH
LABATO DITCH
TAOS VALLEY DITCH NO. 3
TAOS VALLEY CANAL
Punche Arroyo
COVE LAKE RESERVOIR
ALTA LAKE RESERVOIR
ALTA LAKE
PINE HILLS
Lobatos
int

Scale 1:24000

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SHEET NO.17
CONEJOS COUNTY AREA, COLORADO
KIOWA HILL QUADRANGLE)

1 900 000 FEET
R. 10 E.
(Joins sheet 12)
R. 11 E.
105° 45'
37°07'30"
160 000 FEET
JOHN JAMES CANYON
HILLS
KIOWA HILL
LUIS
SAN
PINE
SOUTH
HILLS
PUNCHE
TWIN
LAKES
VALLEY
Punche Arroyo
TAOS VALLEY DITCH NO. 2
TAOS VALLEY DITCH NO. 1
RIO GRANDE RIVER
COSTILLA COUNTY
(Joins sheet 16)
(Joins inset B, sheet 13)
T. 33 N.
T. 32 N.
130 000 FEET
37°00'
105° 52'30"
(Joins inset D, sheet 1)
1 920 000 FEET

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1 ⅝ ½ ¼ 0 1 2 Miles
5000 4000 3000 2000 1000 0 5000 10000 Feet
Scale 1:24000

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